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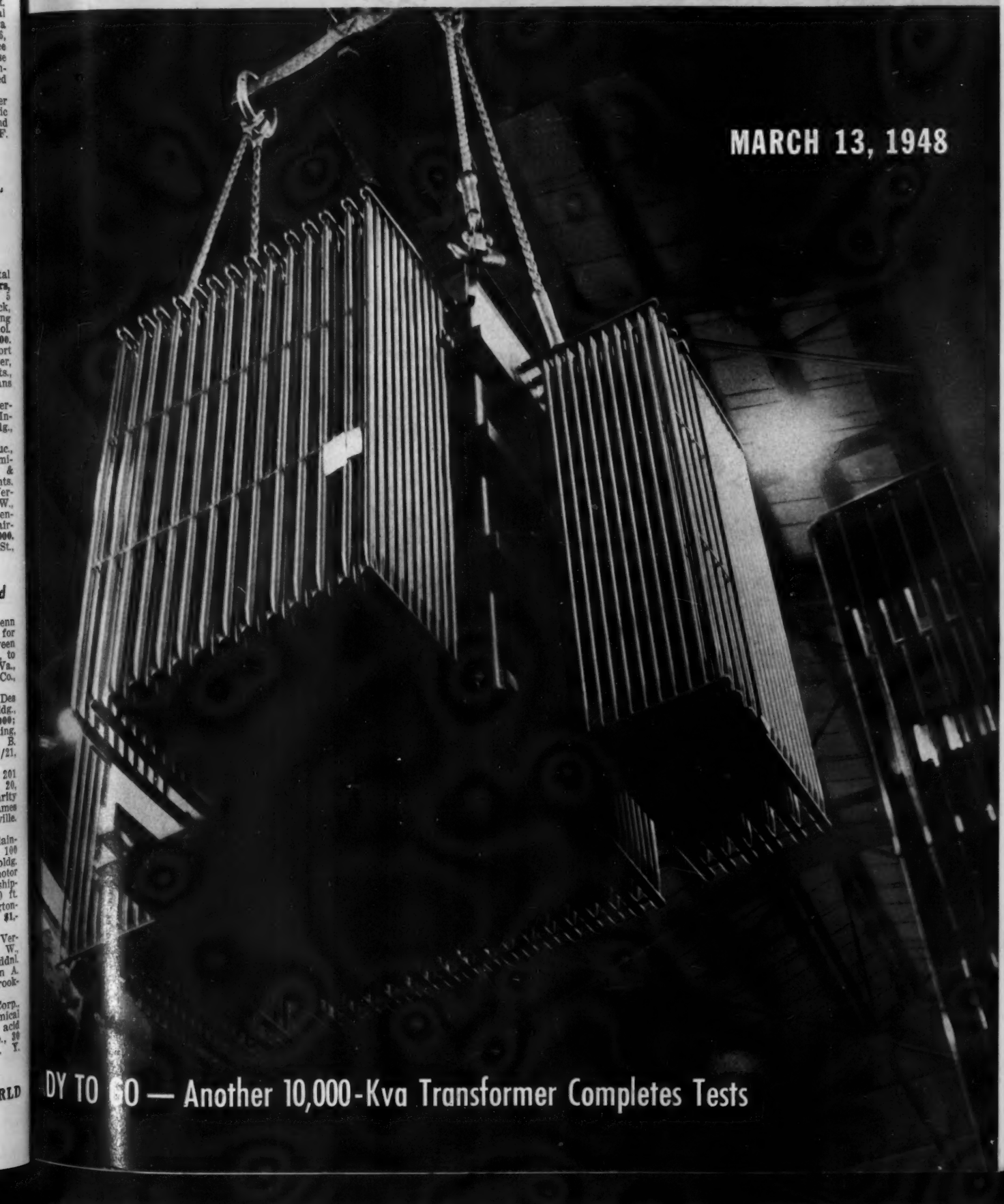

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ELECTRICAL WORLD

Published 74 years for those engaged in the business of generating, transmitting, distributing or applying electric power

March 13, 1948

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Swinging high over the test pit of Westinghouse's Sharon plant, this 10,000-kva transformer has successfully undergone all tests and will soon be contributing its share in providing electrical power to industrial and residential consumers

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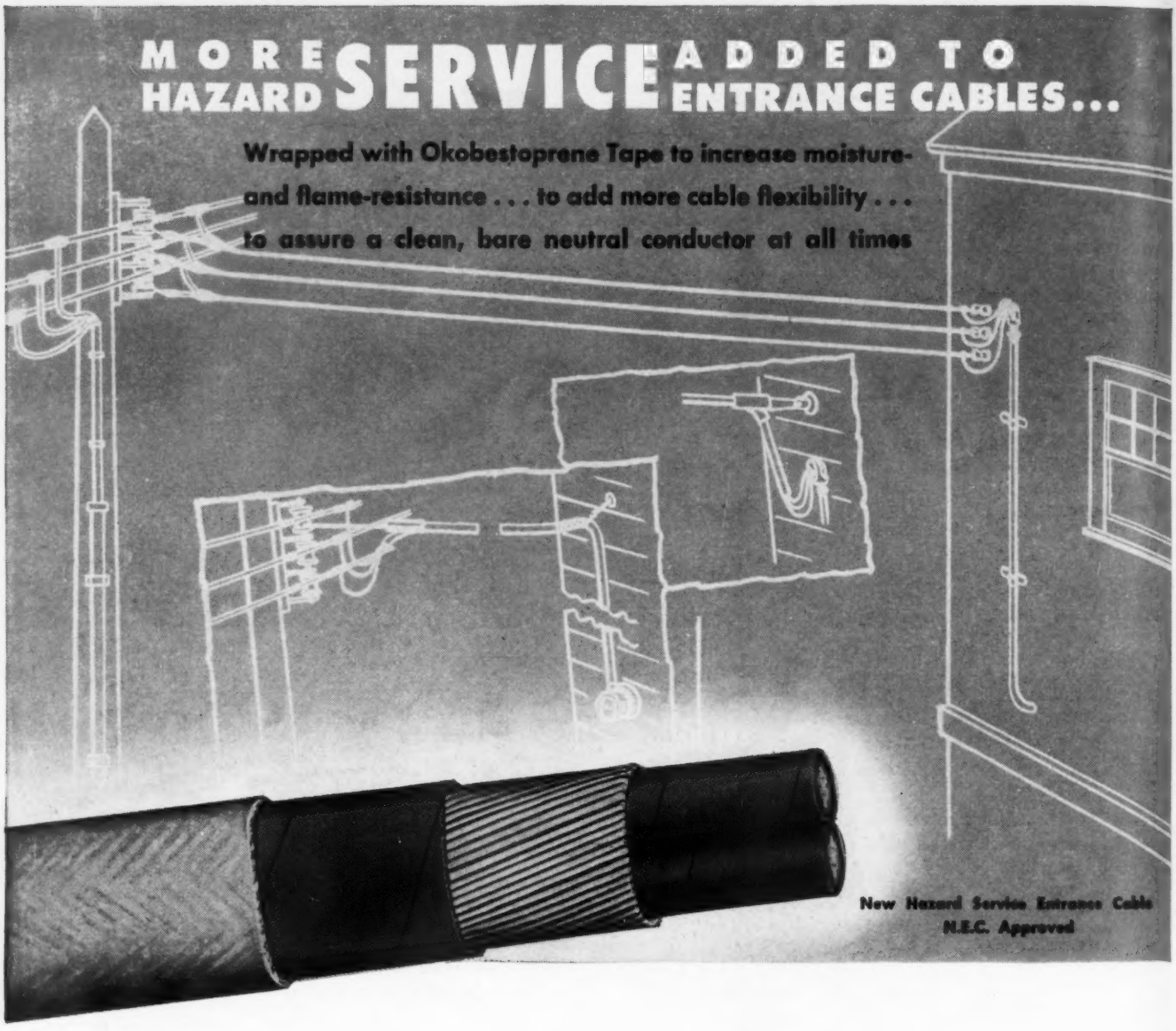
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ELECTRICAL WORLD — Editorials

MARCH 13, 1948

Utility Income: Class vs. Mass?

A MOST COMPELLING argument for selective load building is revealed in the 1947 record of electric utility operations. It is also in the 1946 record, and in the record of every year. It is the difference between the ratios of large light and power sales and revenues to total sales and revenues.

On page 155 of ELECTRICAL WORLD's latest Annual Statistical Number appears the information that sales to large light and power customers were 112 billion kwhr in 1947. Total sales were 216 billion. The ratio is 51.8 percent.

Now we turn to page 157. Here we see that revenue from those customers in 1947 was $1,085 million. Total revenue was $3,800 million. The ratio is 28.6 percent.

Large industrial loads used 51.8 percent of the energy sold, but contributed only 28.6 percent of the revenue. Ratios of like disparity show up in every year of record.

Well, what is there in this to get excited about? Everyone knows that industrial service is low-rate business, and for good and sufficient reasons. It always has been and it always will be. The fact that the unit revenue is low is no proof that the business is unprofitable.

But in the peace year of 1947, industrial sales were within 3 percent of the highest war year. So we feel justified in asking a question: How long is it since the average power company last looked at industrial service to see if it is profitable at present rates?

According to a year-end release from the Edison Electric Institute, average cost of power plant fuel was over $6 per ton of equivalent coal at the end of 1947. In 1939, the cost was $3.10, about one half of what it is now. To some degree, but not completely and not in every case, coal clauses protect the utility on this front. But what about labor, now 80 percent higher than in 1939, and other cost elements?

Industrial service is business of narrow profit margin. This is because it usually has been sold against tough competition. More than any other class of utility service, it is vulnerable to the impact of rising costs. Is the price at which industrial power is sold in line with present conditions? Is it in line with what the customer must pay for a competitive service today?

We have referred only to industrial service. It stands out most prominently in comparisons of sales and revenue ratios. But if its proportions in the total picture are wrong under present conditions, so also are the proportions of some or all other customer groups.

Isn't now the time, then, for searching examination of revenue ratios of the different classes of electric service? How about re-evaluating each class. Why not redetermine the fundamental bases of selective load development? Such an appraisal could well lead to these conclusions: (1) The classic bases are obsolete. (2) Electric service is worth more than the public pays for it. (3) Selective load development, to be successful, requires even more and better sales promotion and salesmanship.

Revolt in the Kitchen

A SOUND, DEVELOPING residential load is one of the most cherished possessions of any operating electric utility. And electricity in the home is pretty widely controlled by the ladies. Thus, electric utilities ought to take a long, if amused, look at some recent goings-on in Washington.

Seems a number of ladies had a conference on "The American Woman," in celebration of the 100th anniversary of the Women's Convention of 1848. Where the utilities came in was in some of the cracks which flew about on home appliances. A number of these professional women wanted "services" not "gadgets."

"The mechanical gadget", said one of them, "is just the old-fashioned spinning wheel in modern dress."

Ladies, how could you? After all the time, money and intellectual B.t.u.'s which have been poured into the modern electric kitchen, how could you possibly come up with a remark like that?

After the billions which have been spent on power systems so you can have and use these washers, refrigerators, ranges, hair curlers and mixers, what lets you be so scornful? Gadgets, indeed! 1948 models of the spinning wheel, to be sure!

Perhaps the unkindest blow of all was the comment of a woman magazine writer, who said, in part:

"Home is the only part of the American economy where one person has to do everything."

For heaven sakes, girlie, thank your power supplier. Home is the only part of the American economy where one person can do everything.

Joining the Issue At Last

MANY ASPECTS of the federal's government excursion into the electric power business have troubled private electric utility people for years. Chief among the irritants has been the repeated assertion that the government isn't really in the power business. It has been reiterated, orally and in law after law, that power is only incidental; that it is nice to have in a project as a revenue producer, but that it just isn't comparable to a commercial power system operation.

One of the reasons why this ridiculous position has rankled so deeply is because it has been difficult to come to grips with it. Rarely has it been possible to have a showdown on this issue.

Perhaps such a showdown will be possible soon. In less than two months, hearings are to begin on an application by Pacific Gas and Electric for a license to develop a hydro site on California's Kings River. The Reclamation Bureau has announced it will fight the license, and on these grounds:

1. Kings River power is needed for Central Valley irrigation pumping.

2. Kings River power is needed as an irrigation subsidy.

3. Reclamation will develop Kings River power fully.

4. Because the government is building a dam on the Kings River now, it should build all other dams on the Kings.

Only time will tell whether PG&E gets the license. Indeed, law and precedent on such cases make it look black for the company. But if the Reclamation Bureau puts on any witnesses who argue on the basis of the last two points noted above, watch out. At that point, the private power business will certainly get a chance to come to grips with the philosophy that government power isn't really in the power business.

Doing the Job in Alabama

THE ALABAMA POWER Company and the U. S. Bureau of Mines are going to try again on the underground gasification of coal. They gave it a test last year, with results which were technically successful, but of little practical value.

Is there any real hope of ultimate, practical success? We don't know. A lot of coal people consider the idea just one step short of perpetual motion.

But, just for the record, let it be noted that a tax-paying, business-managed utility, assisted by the government to be sure, is back in business at the old stand. It's spending time and money trying to improve electric service. The Alabama project is another in a long line of similar projects which utilities have been working on for a generation. It's a new attempt to do the job better, not because the state forces such effort, but because pride in the job forces it; because the ceaseless assault upon high costs forces it; because additions to man's knowledge force it. It's a new attempt to carry on an old industry tradition—ever-better service to ever-increasing customers at ever-descending cost.

Cheap Power and Industrialization

MORE OR LESS HEATED argument has flourished over the question: Does a superabundance of cheap electric energy contribute heavily to the industrialization of a given, unindustrialized region? One of the most convincing arguments that it does not necessarily do so comes from President George M. Gadsby, of the Utah Power and Light Co. Says Gadsby:

"The average cost for industrial power in Utah decreased over 9 percent from 1940 to 1946 while Utah taxes for state and local government increased from $35,700,000 in 1940 to $72,000,000 in 1947—over 100 percent. All industrial customers supplied by this company in 1946 paid a total of approximately $4,500,000. It is apparent, therefore, that the greatly increased cost of state and local government is a much more important item than the cost of power and will have more effect upon the location and growth of industry in Utah."

NEWS OF THE ELECTRICAL WORLD

The Electrical Week

California's Governor Warren has been asked to help end the deadlock between Pacific Gas & Electric and the Reclamation Bureau over distribution of new Shasta output. PG&E refuses preference distribution. Reclamation demands it. . . . In Washington, the Supreme Court threw out patent agreements involving two electrical manufacturers . . . A five-year hydro construction program for the Philippines is about ready to start—capacity addition: 238,000 kw . . . And back in California, the drought has brought emergency daylight saving as a power saving measure.

. . .

Coal supply promises to be all right for another year—if John Lewis' miners don't take another long vacation. 1948 production, already hampered by cold weather, is only 8.1 percent below that of a comparable period last year. The deficit shrinks weekly.

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Hard times are here—for the people who scrap power plants. FPC reports that only four—totalling 598 kw—were decommissioned in January.

. . .

It's too bad electric companies can't finance their expansion programs by selling bonds to state unemployment compensation funds. These reserves hit an all-time high of $7.1 billion last September. National Industrial Conference Board says every state has a reserve "at least triple" its highest annual expenditures. Twenty-two of them have reserves 10 times their highest annual outlay. There's another $800 million in federal reserves.

. . .

A three-reel movie, "The Great Swindle," is being produced by Union Films for UE-CIO. It deals with inflation. Director, and operator of Union Films, is Carl Aldo Marzani, former State Department employee whose conviction for falsifying Communist connections is under appeal.

. . .

Midwest utilities are making big purchases of diesels. One company is putting in 11, one each month. Capacity of this group: 15,000 kw. Other systems expect to add 10, 8, 6 and 4 units respectively.

Sixty percent of the 52,179 engineering students enrolled in electrical courses last November 1 were veterans. Extension courses had another 947 students, and graduate work another 3,154. There were 53,308 undergraduates in mechanical engineering courses then. Electricals and mechanicals make up 45 percent of enrolled engineering students.

. . .

France has electric service only every other day. But the people still have a sense of humor. They call it alternating current.

. . .

Oak Ridge's control panels contained at least 100,000 instruments. The panels stretched for "miles." Just a thought for the future, if and when utilities get into the atomic-electric business and its remote-control operation.

. . .

Labor difficulties have been a contributing factor in the mounting industrial load of electric utilities. Many industrialists, who once might have built their own power plants, now say they prefer to get utility service to avoid the necessity of dealing directly with another union (the power plant operators).

. . .

Rochester Gas & Electric is selling appliances to employees at company cost. First offer was of laundry equipment. Other appliances will follow. Idea is to sell employees—and get them fully informed—on electricity-using devices.

. . .

Railway electrification has paid off in Sweden. From 1939 to 1945, it saved the Swedish State Railways—compared with an equally capable steam system—an amount equal to the 460 million kroner invested in electrification so far.

. . .

Some construction mechanization items which weren't attractive a year ago are being re-examined—and bought—today. The reason: labor cost increases. Latest examples we've heard of: jeep-mounted air compressor; jeep knockabout fitted with a snow plow; heavy digger trucks.

Krug Asks California Governor to End Utility-Reclamation Deadlock

INTERIOR SECRETARY Krug has called on California's Governor Warren to help break the deadlock between the Bureau of Reclamation and Pacific Gas & Electric Co over additional energy soon to become available from the Bureau's Shasta Dam power plant.

Krug made his appeal in a telegram, March 5, offering the new Shasta power for use by the "people of California" during the "present critical power situation." The energy could be marketed "by any agency" designated by the governor, the wire stated.

PUC Hearing March 12

The California governor's reply and a subsequent telegram on the same topic by Krug were not made available by the Interior Department. However, California reports advised that Governor Warren had instructed the Public Utilities Commission to hold a hearing March 12 on the Shasta power controversy. Secretary Krug also was reported to have reiterated his offer to permit the state to market the new power.

The governor told newsmen that, as far as he could see, the state would have no choice but to turn the power over to PG&E for distribution if the Krug offer were accepted.

PG&E already is purchasing approximately 2,000,000 kwhr of Shasta energy daily, the total output of the plant's existing generating facilities. Present output, they added, is limited by the scarcity of water. In addition, all possible water is being stored in Shasta reservoir for irrigation needs, these sources indicated.

First Unit under Test

Two 75,000-kw generators, used at Grand Coulee Dam during the war, now are being installed at Shasta. Two units of similar capacity already are in operation there. Tests of the one new unit were completed last week, and the machine will go on the line within a few days. The second new unit is expected to be ready in summer.

The quarrel between the Bureau and PG&E involves the production of the third unit. The Bureau claims that the utility, which owns the only transmission lines available for distribution of Shasta power, has refused to give priority in distribution to federal agencies, public bodies, and cooperatives. Such priority is required by federal law, the Bureau contends.

Company spokesmen have pointed out that their present contract for Shasta power contains no priority clause. The utility has refused to agree to any priority provision regarding distribution which would require it to build up competitive public agencies.

At stake are some 2,000,000 kwhr of new power daily. Reclamation officers estimate that energy production at Shasta will be increased to 4,000,000 kwhr daily between April 1 and 15, when water is released from the dam for irrigation and the project's third generating unit is in operation.

Secretary Krug, in his initial telegram to Governor Warren, blasted PG&E for its "refusal to consider" a contract giving preference to public bodies in the distribution of Shasta energy.

"It is my view," Krug stated, "that in emergencies such as this, an adamant stand by a public utility corporation cannot be permitted to affect the general welfare of the state, its agriculture, or its industry . . . I am therefore offering to you, for use during this emergency, all new power at Shasta dam power plant. This energy can be marketed by an agency you may designate. Only basic requirement I care to impose is that this energy should be made available to agriculture and industry without any middleman's profit."

In calling the PUC hearing, the governor expressed the hope that PG&E and the Bureau could come to an agreement in the interim. Such action, he declared, would be "highly desirable from a public standpoint."

•

Drafting Chicago Franchise

Actual work of drafting an ordinance giving Commonwealth Edison Co a 40-year franchise in Chicago is now underway. The work is being done by the City Council Utility Committee. Among the points tentatively agreed upon is an increase in franchise tax from 3 to 4 percent of gross receipts.

Index Available

Copies of *Electrical World's* semi-annual index are now available. Subscribers may obtain copies without cost by request to: The Editor, Electrical World, 330 West 42nd St, New York 18, N. Y.

PEPCO Allowed Return of 5½% on Investment

Potomac Electric Power Co will share with its customers any of its future earnings in excess of a basic 5½ percent return on net investment.

That's one important effect of modifications recently made by the District of Columbia Public Utilities Commission in the "sliding scale plan" for regulating PEPCO rates. These revisions also:

1. Afford the utility limited means of relief during years when its revenues fall below the allowed 5½ percent, and
2. Dispose of funds "frozen" by the PUC in previous years as "excess earnings," which have been a source of controversy among the Commission, the utility, and the latter's customers.

Findings of PUC Survey

The sliding scale formula, in effect since 1925, provided for annual review of PEPCO operations. In accordance with its findings in these surveys, the PUC established rates and earnings of the company for the succeeding year. For the last three years this has resulted in the freezing of large sums from the utility's revenues as "excess earnings." A total of $312,230 of 1945 and 1946 earnings were put into a special reserve fund. Similarly, the PUC impounded $673,178 of earnings during the period March 1 to Sept 10, 1947, as "reserve for refund."

"Deferred Credits" Set Up

The new PUC order transfers the $312,230 and $401,281 of the 1947 reserve to a new "deferred credits" account, from which customer refunds may be made. The remaining $271,897 of impounded 1947 funds will be set aside for "tax liability" or possible refund.

Half of any excess earnings above PEPCO's basic 5½ percent return will be channeled into the "deferred credits" account. The utility will retain the other half as part of its "allowed return." Payments into the "deferred credits" account will be set annually by company reports based on earnings during the first nine months of each year, subject to adjustments at the end of the calendar year. Refunds to customers, if any, will be determined by the PUC from these reports and deducted from December bills.

But the "deferred credits" account may be a give-and-take affair. Whenever company earnings fall below the basic rate of return, the deficiency will be made up from this account to the extent that funds are available. Thus, for the current year, for example, if PEPCO earnings fall that much below

5½ percent it may withdraw the entire $713,511 from the account.

The PUC order retains PEPCO's present service rates but makes provision for proceedings before the commission on rate adjustments at any time on the initiative of either the PUC or the utility. All terms of the order are effective as of Jan 1, 1948.

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Northwest Construction to Add 1,250,000 Kw

Construction in the next seven years which will cost an estimated $500,000,000 and add 1,250,000 kw to the Northwest power grid is under consideration by 12 power corporations and three municipal systems in Washington, Oregon, Idaho, Montana, Utah, and British Columbia, according to a survey recently completed.

This program, plus 4,000,000-kw in installations proposed by federal agencies, would bring the area's installed capacity to 8,750,000 kw by 1956, of which the government would control almost two-thirds.

Raising of existing dams would add 100,000 kw to the grid, the survey revealed.

Among the private companies with plans for additional generators are: Pacific Power & Light Co, Ariel Dam, Lewis River, 50,000 kw; Montana Power Co, new generator at Kerr Dam on Flathead River, 60,000 kw; Idaho Power Co, four dams, 185,000 kw; British Columbia Electric Railway Co, Fraser River, 90,000 kw; California-Oregon Power Co, 30,000 kw; Utah Power & Light Co., steam plant near Ogden, 40,000 kw; Puget Sound Power & Light Co, Rock Island Dam, 50,000 kw.

Two Seattle municipal dams would develop 420,000 kw and Eugene, Ore., expects to have an additional 36,000 kw by 1950.

•

Residential Use Grows

Residential use of electricity by customers of the Pacific Power & Light Co, which serves Portland and other areas in the Columbia River valley, increased 18 percent in 1947. Average annual home use has reached a new high of 3,730 kwhr, nearly three times the national average. Despite heavy increases in direct taxes and operating expenses, residential rates continued to decline during the year, dropping to a new low average of 1½ cents per kwhr, approximately one-half the national average. Residential rates are now 6.2 percent lower than a year ago.

Supreme Court Decision Strikes Blow at Price Fixing under Patent Licenses

THE SUPREME COURT this week laid down the first of a possible series of restrictions against price fixing under patent licenses.

In its most important move in this direction, the Court held that price limitations set on dropout fuse cutouts by Line Material Co, under a cross-licensing agreement with Southern States Equipment Corp, violated the Sherman Anti-Trust Act. The court split 5 to 3.

In a concurrent action the Court unanimously sustained similar anti-trust charges against United States Gypsum Co and six other firms. These held licenses to produce gypsum board under patents held by the former.

The decisions cast a shadow of possible anti-trust actions against hundreds of concerns now manufacturing electrical equipment under cross-licensing arrangements or so-called patent pooling. This is particularly likely wherever the patent holder, or holders, have included in patent licenses any agreements to maintain prices.

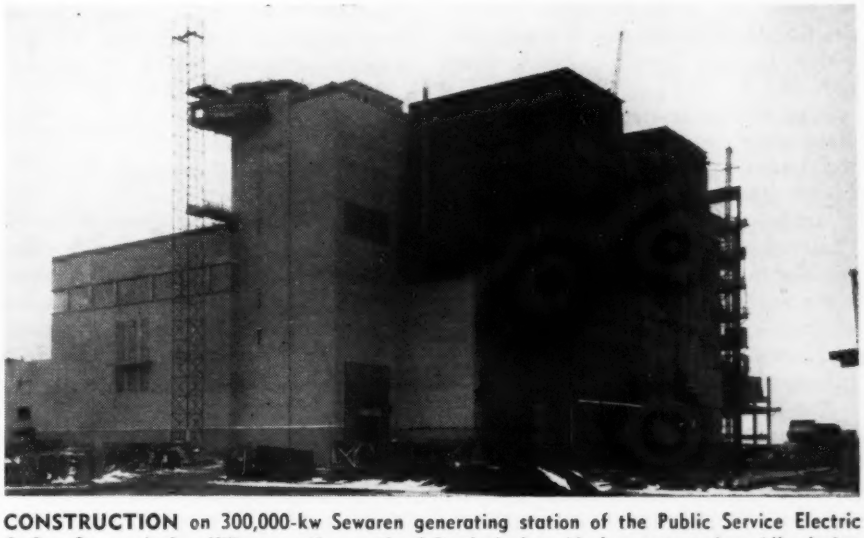
In both of this week's cases, the High Court upset lower court rulings. These had dismissed Justice Department charges that price limitations set by patent holders were in restraint of trade under the Sherman Act. The lower courts were ordered in each case to render new decisions in accord with the Supreme Court's findings.

The Justice Department already is prosecuting nine cases involving reported price fixing under patent licenses. These cases are against the General Electric Co (two), General Cable Corp, Allegheny Ludlum Steel Corp, American Optical Co, Bausch & Lomb Optical Co, Catalin Corp of America, General Instrument Corp, and Phillips Screw Co. The suits against GE, pending before district courts in New York and New Jersey, involve patents held by the company on tungsten carbide and on lighting bulbs. General Cable is being sued in New York by the government because of its licensing arrangements for manufacture of patented fluid filled cable.

In addition, the Justice Department announced that "more than 100 companies" must re-examine their patent agreements with other firms as a result of the decisions.

Both of this week's cases were argued by the defendants upon the basis of a 1926 decision of the Supreme Court. This decision approved the legality of price limitations set by General Electric in patent licenses covering incandescent lamps developed by GE. In that case, the Court held that a patent holder might require licensees to adhere to the sale price schedule of the licensor.

Fully half of the participating Justices (Justice Jackson, a former attorney general, took no part, in either decision) moved to abandon this principle. Chief Justice Vinson and



CONSTRUCTION on 300,000-kw Sewaren generating station of the Public Service Electric & Gas Co, on Arthur Kill, two miles north of Perth Amboy, N. J., progressed rapidly during the winter despite the bad weather. The first two of the three 100,000-kw turbine-generators are scheduled for operation this fall. Throttle conditions are 1,500 psig and 1,050 F. In the buff grey, solid brick structure, from left to right, are the service building, turbine room, boiler house, outdoor portions of the boilers, and steelwork for third boiler.

CAPACITY of the Connecticut Light & Power Co's Montville Plant will be increased to 101,000 kw by the addition of these two 31,250-kw turbogenerators. The turbines will operate at 850 psi and 950 F. The first unit is to go into operation shortly and the second in fall. R. W. Watts, left, superintendent of the Montville Plant, and Roger Covell, General Electric Co erection supervisor, discuss progress of the installation

Justices Frankfurter and Burton, in a dissent written by the latter, declared that the GE decision legalized the cross-licensing agreement between Line Material and Southern States, as well as the licenses issued by Line Material to 10 other equipment manufacturers.

Writing the opinion of the court, Justice Reed held with the minority that the 1926 General Electric decision was valid. He contended, however, that "the merging of the benefits under the patents" resulting from the Line Material agreements was in violation of the Sherman Act. The patent laws, he pointed out, contain no authority "to combine with other patent owners to fix prices on articles covered by the respective patents."

No-man's Land

In effect, the Reed opinion attempted to cover the no-man's land between the GE decision and the Sherman Act, which Justices Douglas, Black, Murphy, and Rutledge in their concurring opinion held to be irreconcilable. Thus, Reed simply ruled that the Line Material case "crosses the barrier erected by the Sherman Act against restraint of trade" because of "the cumulative effect of such multiple agreements in establishing an intention to restrain."

He warned that leaving the location of this "barrier" to the courts might invalidate "any arrangement between patentees" involving price fixing.

The U. S. Gypsum decision was based upon more clear-cut issues, with the Court finding that the company and concerns it has licensed, has established an elaborate price-fixing organization. The Court further held that price fixing was so general that it effected most of the building construction industry.

Three patents were involved in the Line Material decision. Two covered similar types of dropout fuse cutouts, one developed by Line Material and the other by Southern States. A less important patent was one covering a fuse cutout housing held by Line Material.

Since economical manufacture of the cutouts required use of both patents, Line Material and Southern States worked out a cross-licensing agreement containing a price-fixing clause. Under this agreement, Line Material issued licenses for the manufacture of both developments, also subject to the same price schedules.

The companies licensed and involved in the anti-trust suit were: General Electric, James R. Kearney Corp, Westinghouse Electric Corp, Schweitzer & Conrad, Inc, Railway & Industrial Engineering Co, W. N. Matthews Corp, Porcelain Products Co, Royal Electric Manufacturing Co. Pacific Electric Manufacturing Co, and T. F. Johnson.

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Utah Co-op Formed

The Southwest Utah Power & Development Co, a new non-profit cooperative, has filed articles of incorporation with the secretary of state. The group was organized to promote development of additional power in Iron and Washington Counties. LeRoy H. Cox, St. George, Utah, is president. Directors have authorized engineering studies preliminary to construction of a large generating plant near coal deposits in Coal Creek Canyon, east of Cedar City. They also agreed to investigate possibility of purchasing present properties of the Southern Utah Power Co, which now operates in the area.

U. S. Indicts Contractors in Texas for Price Fixing

A group of Texas electrical contractors and equipment suppliers has been indicted for violations of anti-trust laws. The indictment, brought in by a federal grand jury at Dallas, charged the group with conspiring to restrain trade in the sale of lighting fixtures and other supplies, and in the installation of house wiring.

The defendants included the Northeast Texas Chapter of the National Electrical Contractors Association, its manager, seven members of the chapter, four jobbing concerns, and six representatives of these firms.

The indictment said the conspiracy consisted of an agreement to fix prices, with suppliers refusing to sell lighting fixtures directly to consumers unless the sales price included a commission paid to the electrical contractors. It also alleges that contractors refused to install fixtures purchased direct by consumers or to supply only the labor for installation except at additional cost. The NECA chapter was accused of taking part in a "bid registration system" designed to stabilize bid quotations.

Assistant Attorney General Sonnett asserted that the Justice Department has been investigating "similar situations in other cities." Indictments already have been returned in Seattle and Kansas City, he said.

Defendants in the Texas suit are:

Northeast Texas Chapter, NECA; Lawrence Martin, chapter manager; J. L. McClure, chapter president; E. T. Raney, treasurer; F. Henry Gable, director; and T. C. Sands, Sands Electrical Contractors and Neon Sign Co; Roy P. Gay, Gay Electrical Shop; George L. Harris, Southwest Electrical Co; N. T. Ivy, Ivy Electrical Co; General Electric Supply Corp; Westinghouse Electric Supply Co; Meletio Electric Supply Co; Beckett Electric Co; Percy Rawlinson and J. C. Robinson of Beckett Electric, Jack Meletio of Meletio Electric; E. Robinson of Westinghouse Electric Supply; and G. L. Ralston and H. B. Sudicum of General Electric Supply.

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4th Unit for Sewaren

Public Service Electric & Gas Co, Newark, N. J., has placed an order with the Westinghouse Electric Corp for a fourth 100,000-kw turbine generator for its Sewaren Plant. Installation is to be made in 1951. Two units are to go into operation this fall. The third is to be ready late in 1949. The station is being expanded to handle the heavy North Jersey industrial load.

5-Year Hydro Program Will Raise Philippine Capacity by 238,000 Kw

A 5-YEAR $88,000,000 hydroelectric power program for the Philippines is rapidly approaching the stage where construction can be started, according to Filemon C. Rodriguez, manager of the National Power Co of the Philippines. It is the first step in an overall plan.

With the 5-year program, for which the general plans were prepared by the Westinghouse Electric International Co, New York, an installed capacity of 238,000 kw is scheduled. Construction to prime up 9,000 kw of existing hydroelectric capacity is also planned.

American Companies Assist

American firms are expected to assist in the preparation of detailed plans and specifications. U. S. contractors will also be requested to submit bids.

Biggest of the projects planned calls for development of the Agno and Toboy rivers on Luzon Island north of Manila. Estimated to cost about $59,000.000, this project calls for the construction of the first two of eight dams to utilize eventually a total fall of 2,293 ft and to permit an ultimate installed capacity of 424,000 kw. The first phase would include construction in the Cordillera Mountains of Ambuklao Dam on the Agno River. By locating the power house some distance downstream, a 407-ft head could be utilized. Installation of two 36,000-kw units is planned.

Several miles downstream from the first dam at the junction of the Twin River with the Agno, a second, equally-high structure, of similar design, known as Itogon Dam would be built. With this project a 458-ft head would be utilized by two 43,000-kw units. Construction of important transmission lines connecting the two dams with the Manila area, plus other distribution facilities, also is planned.

Mindanao Project

The other six dams planned for the Agno and Toboy rivers would be built in subsequent programs. Most of them would be lower structures. However, one of these structures, Kalipkip Dam, would have a maximum height of 330 ft.

Another big project included in the first phase of the comprehensive program will be located on Mindanao. It calls for utilizing the fall of the Agus River between Lake Lanao and the sea. The river drops some 2,300 ft in less than 24 river miles. An ultimate development of 736,000 kw is planned. Construction of seven dams will be required, but in the present program only two dams would be built. One of these would be a low regulation dam where the river leaves the lake. The other would be near the sea and known as Maria Cristina Dam.

The latter dam would be a low structure located upstream from the Maria Cristina Falls. The ultimate capacity of this project is listed at 200 000 kw, of which 80,000 kw would be installed with the initial work. At first a head of 518 ft would be utilized, but later, crest gates would be added to bring this head up to 534 ft. The last project is expected to cost $11,700,000.

Robert Russel, project development manager of the Westinghouse Electric International Co, was in charge of the general report on the comprehensive plan. He was assisted by L. Gray Marshall, technical coordinator for the same firm; C. B. Myhre, electrical engineer with Westinghouse; M. G. Salzman, consulting hydraulic engineer with Ebasco Services, Inc; R. S. Quick, hydraulic engineer of the Baldwin Locomotive Works; and Orman Strange, construction engineer with Morrison-Knudsen Co. An independent review of the data and survey was made by A. V. Karpov, consulting engineer of Philadelphia.

Mr. Rodriguez is expected to return to the U. S. early in April. At that time he may be contacted through the Philippine Embassy, Washington, D. C.

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Utilities Fuel Consumption in January Remained High

Electric utilities continued their high use of fuels for steam electric generation during January, the Federal Power Commission has reported. Coal consumption of 9,134,714 tons set a new monthly record. This was a 22.4% increase over consumption in January, 1947. Of the total, only 339,052 tons were anthracite.

Fuel oil consumption was 4.432,747 bbl, a 0.2% increase over January a year ago. Gas consumption of 28,949,627 mcf was 32.2% higher than a year previously but was still under December 1947 consumption by 3.6%.

Coal stocks declined during January. But the 17,878,367 tons on hand on Feb. 1 were 19.5% more than a year previous. Fuel oil stocks of 6,085,895 bbl were sufficient for 43 days.

Decertification Election Ordered Against UE Unit

One of the first decertification elections against the United Electrical, Radio & Machine Workers, CIO. will be held within 30 days at Unique Manufacturing Co, Chicago, manufacturer of blow torches, fire pots, cable splicers, and accessories.

The National Labor Relations Board ordered the election pursuant to a petition filed by a worker, Alex George. If the workers vote against the UE, it will no longer have bargaining rights. If they favor the UE, NLRB will not be able to certify it because it has not met the qualifications of the Taft-Hartley Act. But the election will bar the holding of another election within a year, thus preventing another union from seeking bargaining rights during that time.

The company has recognized UE only since Oct 31, 1946, when it signed a one-year contract, renewable from year to year. It gave notice last August of intention to terminate the agreement on Oct 31. In the meantime. on Oct 1, the worker, Alex George, filed the decertification request.

NLRB has directed a ba.gaining election at the Allentown (Pa.) plant of Western Electric Co. Production and maintenance workers, including those in the cafeteria. will choose between the Communications Equipment Workers, affiliate of the Communications Workers of America (formerly National Federation of Telephone Workers), the IBEW, or neither.

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Planned Lighting Show Conducted at Pittsburgh

All phases of the electrical industry were represented last week at the four-day Planned Lighting Exposition and Conference held at Pittsburgh. The Commercial and Industrial Sections of the Electric League of Western Pennsylvania were the sponsors. Attendance was estimated at 12,500, with 6,769 persons actually registering.

R. L. Whitney, Westinghouse Electric Supply Co, estimated that a $1.5 billion lighting market exists but that through proper planning and sales effort this can be increased five-fold.

Electrical contractors were warned by a number of speakers that they must set up the proper organization, including designers and engineers, to do a good job of selling Planned Lighting. Otherwise, the other segments of the industry are going to find their own ways of getting the job done.

Utility Condemnation Law Voided by Arizona Court

Arizona's Supreme Court has voided a state statute permitting condemnation of utilities by municipalities on grounds the law allowed seizure of private property without just compensation.

The ruling is the latest development in the four-year old fight by the City of Tucson to condemn and acquire properties of the Tucson Electric Light & Power Co which was caught in whipsaw action between the state law and orders by the Arizona Corporation Commission.

Upon receiving notice of condemnation on action by the City of Tucson four years ago, the utility drastically curtailed expansion because the now-voided state law specified a utility could not claim compensation for improvements, additions or extensions of its properties carried out after the date upon which it had been served with notice of condemnation.

Meanwhile, the Corporation Commission had ordered the utility to make capital additions and extend its service to meet the demands of population increases.

Arizona now is faced with the necessity of writing a new law by which utilities' values may be established to the time they actually are taken over by municipalities.

As a result of the ruling, federal courts must dismiss the present Tucson litigation, and the Tucson utility will be free to make necessary expansions without fear of loss on the investment.

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Union-Utility Relationship at Indianapolis Threatened

For 10 years the Indianapolis Power & Light Co has bargained with the Electric Utility Workers Union (Ind) over wages and working conditions for essentially all of the company's non-supervisory employees.

This relationship is now threatened by an order of the National Labor Relations Board granting a request of the Utility Workers Union, CIO, Local 343, for separation of so-called "physical" employees from the others and for an election to determine whether they wish to be represented by the CIO union, the Independent Union, or neither.

The "physical" group includes production, maintenance, construction, and distribution workers. Excluded are office, clerical, professional and technical employees, guards, supervisors and some other "fringe" groups.

In another NLRB-directed election, three unions will vie for the right to represent manual workers in the sales department of the Detroit Edison Co. The election was sought by the IBEW-AFL but the UWUA-CIO, and the Detroit Edison Employees Association will also appear on the ballot.

At Central Louisiana Electric Co, NLRB will hold an election to determine whether production and maintenance employees, excluding office workers, wish to be represented by IBEW Local 576.

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25 to 60 Cycle Conversion in South Ontario Likely

Conversion of the Southern Ontario system of the Hydro-Electric Power Commission of Ontario from 25 to 60 cycles was indicated recently (Feb 26) by Premier Drew. He announced that his government would make such a recommendation to the Ontario Legislature.

The Premier said that the change must be made now or never. Hydro now has a $300,000,000 expansion program. If any considerable amount of this should be spent for the 25-cycle system, the cost of conversion later would be prohibitive.

The cost, the Premier estimated, will be $191,000,000. Extension of the life of equipment and other capital improvements to the property of the Ontario and municipal commissions would cut the gross cost of the change-over by some $28,000,000 to $163,000,000. The plan for financing the change-over was not revealed. There were indications that the municipal systems would not pay any of the expense. This would mean that Ontario Hydro or the province will foot the bill.

Advantages given for making the change were that cheaper electrical appliances and manufacturing machinery will be usable and better interconnections with neighboring systems will be made possible.

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New Transmission Lines Scheduled for Northwest

New transmission facilities in the Northwest completed or under way have been recently reported by five electric power agencies.

Bonneville Power Administration energized a 115-Kv line from its Spirit substation in northeastern Washington to the Metaline Falls area, some 18 miles, bringing power for an expansion of the section's mining area. The Pend Oreille PUD cut in on the line to give service to Metaline and the Grandview mines. Service to Metaline Falls will follow as soon as a substation can be completed. Soon afterwards the PUD will add Ione to its list, citizens there having voted to sell to it their municipal diesel-operated plant.

Idaho Power Co has completed a 45-mi, 69-Kv line from near Marsing, Ida., into Jordan Valley. Power for the district was previously generated by diesel units.

A 50-Kv line, 54 mi long, has been put into service by the Montana Power Co between Ft. Benton and Chester. The new line, built at a cost of $200,000 provides a third source of power to the area. The company has announced plans to spend $250,000 for transmission facilities in the area in the next two years. A part of the system will be changed from 50 to 60-Kv as soon as transformers are available to cut over the substations involved.

Mountain States Power Co has started a 20-Kv line to double line capacity into the Cottage Grove, Ore., area. The line will be 21 mi long. The company will increase the voltage to 69 Kv when materials become available.

Washington Water Power Company has announced that construction of a second power transmission line into the Craigmont-Nezperce area in southern Idaho will start about May 1. The 60-Kv line will cost about $265,000. The project includes new substations at Grangeville, Nezperce, and Craigmont and will carry power from Spokane, Wash., to Craigmont via Moscow, Ida.

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Granted 3 Franchises

Interstate Power Co has been granted a 25-year franchise at Amboy, Minn., and 15-year franchise at Rose Creek and Browndale, Minn.

Goating Men to Safety

Casanova, a live goat, is bringing safety to the Wisconsin Power & Light Co. The goat lives a comfortable life as the guest of any district having a lost-time accident. He remains until a lost-time accident occurs in another district. Each district must maintain a goat fund to support him when he is their guest. At the end of the year, any money left in the fund can be used for a party or for any purpose the employees select. The last lost-time accident occurred Aug 4.

California on Daylight Saving Time
Industrial and Farm Power Curtailed

BOTH HOUSES of California's Legislature approved an emergency daylight saving bill last week to conserve power supplies in the drought-parched state. Effective March 14, DST—estimated to save 100,000 to 160,000 kw—will last until mid-January, 1949, or the end of the emergency.

Meanwhile, the increasing drain of an abnormal agricultural pumping load forced utilities in Northern California into a 20% curtailment of industrial and agricultural power. An earlier 10% cut had not quite offset the growing irrigation demand, some 250,000 kw above normal.

The new conservation program required industries in Northern California to go on a four-day week—shutting down completely for 24 hours during the Monday-Friday peak—or effect an equivalent saving during a regular work week.

Stores and other commercial establishments were required to make a similar arrangement. Farmers were asked to forego pumping for one day a week.

New Connections Barred

Simultaneously, an embargo was placed on new electrical connections for industrial, commercial, or agricultural purposes during the emergency.

Other developments in the state's drought crisis, worst in its history, include:

1. Routing of the entire output of one generator at Hoover Dam into Northern California through the lines of the Southern California Edison Co. The power, 120,000 kw in all, 75,000 kw more than PG&E already was receiving from Edison, was made available by the energizing of Los Angeles Light & Power steam plants.

Will Boost Frequency

Some 45,000 kw of the new supply, however, had to be used to boost PG&E frequency back to normal from the 59½-cycle economy level put into effect Feb 2 to synchronize with Edison frequency.

More power from Hoover Dam may be obtained from power-secure Southern California for the northern part of the state on completion of extra transmission facilities between PG&E and Edison.

2. Nevada ordered a brownout in the western part of the state similar to that in Northern California. That area is served by Sierra Pacific Power Co, which depends largely upon PG&E for its power supply.

Southern California utilities also will suffer from the drought even though water supplies from Hoover Dam are plentiful.

Northern California farmers already are agitating for extension of the brownout to the southern part of the state.

The Los Angeles Department of Water & Power estimated that it would lose $400,000 a year in revenue as a result of daylight saving time alone. The measure will probably cut 5,000,000 kwhr a month off its sales, the utility said.

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Arizona Files Application for 2 Units at Hoover Dam

Formal application for installation of two 82,500-kw generators at Hoover Dam to guarantee Arizona's allocated power has been filed by the Arizona Power Authority.

A part of the Commission's co-operative grid plan with the Reclamation Bureau, the program also calls for construction of transmission lines from Hoover and Davis Dams by the Bureau and extension from this arterial system by the Authority to remote sections of the state.

Nevada also is requesting installation of an 82,500-kw capacity generator to set up production for the two states and provide standby protection.

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Better Lighting Guarantee

The National Electrical Contractors Association, beginning June 1, will recommend to its chapters that they include lighting equipment in the NECA Guaranteed Certificate Program. Under this program, the contractor would guarantee lighting installations in homes, commercial establishments, and factories for one year. Written guarantees on satisfactory performance of other types of electrical installations are already included.

Virginia's in Hot Water

In 1947, a total of 7,363 new, separately metered, electric storage water heaters were installed on the lines of the Virginia Electric & Power Co.

Southern California Utility Starts 1st 66,000-Kw. Unit

Southern California Edison Co has placed in operation the first 66,000-kw unit of its 264,000-kw steam-electric generating station at Redondo Beach. Formal exercises will be held in May when the second unit is to go on the line. The other two units are to be installed in 1949. The utility now has a total capacity of 1,460,180-kw in 29 generating plants.

Two innovations at the Redondo Beach Plant are the water cooling system and fuel-oil feeding system. To provide cooling water, two pipe lines, 10 ft in diameter, were built 1,900 ft out in the sea. The one line is used to bring in the water for cooling. The other ejects the warm water. To discourage marine growth in the pipes, the flow of the water is reversed every eight hours. To further assure against marine growth, the discharge water is chlorinated.

Fuel oil is pumped directly to the boiler burners from two 100,000-bbl storage tanks. This system eliminates the need for auxiliary tanks at the boiler plant. Natural gas and, with some modifications, pulverized coal also can be used for fuel.

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New England Engineers Will Offer Meter Courses

The New England Meter Engineers group will again offer electric metering courses. The course will be given April 12 to 16 and will be repeated May 10 to 14. The classes will be held at the general service building of the Boston Edison Co.

Principal topics will be the theory of polyphase metering, electrical fundamentals, simple mathematics, with vectors and their application. The faculty will consist of Frederick Tedford, Wentworth Institute; Arthur Russell, Franklin Institute; W. M. Howe, General Electric Co; and L. M. Partridge and W. G. Weitzel, Narragansett Electric Co.

Tuition will be $15. R. A. Powers, Boston Edison Co, is in charge of registration.

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Buggs Island Bid Rejected

The Army Engineers have rejected the low bid for construction of the Buggs Island Dam on the Roanoke River because it exceeded the government's estimate by more than 25 percent. Another call for bids will be made within 60 days.

3 Texas Co-ops Purchase Lines from San Antonio

Three Texas cooperatives have obtained REA loans to finance acquisition of 400 miles of rural distribution lines from the City of San Antonio. Net cost to the co-ops, who also are selling some facilities to the city, will total nearly $600,000.

The co-ops borrowed $2,435,000 from REA to finance the acquisitions and to erect 763 miles of distribution and 87 miles of transmission lines.

Bandera Electric Cooperative, Bandera, will spend $78,846 of its $535,000 loan to buy 78 miles of lines; Guadalupe Valley Electric Cooperative, cost $477,403 of its $1,430,000 loan for 230 miles; and the Medina Electric Cooperative, Hondo, $91,262 of its $470,000 loan for 92 miles.

Guadalupe is selling San Antonio 70 miles of lines for $50,727.

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Phoenix Utility Gets Gas

Construction of 32 miles of natural gas pipe line has been completed linking the Central Arizona Light & Power Co steam power generating plant at Phoenix with the El Paso Natural Gas Co main line. Ten miles of 10-in. pipe line were constructed by the power company at a cost of $350,000. The rest was built by the gas company to augment present supplies for the City of Phoenix. The new line into the generating plant will have a daily capacity of more than 20,000,000 cu. ft.

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Christoffel Convicted

Harold R. Christoffel, former president of Local 248, UAW, has been sentenced to from two to six years in prison for perjury. One time leader of the union made up of employees at the West Allis Plant of the Allis-Chalmers Manufacturing Co, Christoffel, last March, denied to the House Labor Committee that he had ever been a Communist. The charges grew out of this denial. The case was tried before a jury in the Federal District Court at Washington. Christoffel's lawyers have announced that they will take the case to the higher courts.

MEETINGS

Chicago Technical Societies Council—Technical Conference, Stevens Hotel, Chicago, March 22-24. Robert H. Bacon, chairman, 53 W Jackson Blvd, Chicago 4, Ill.

National Electrical Wholesalers Association—Annual Convention, Hotel Statler, Buffalo, May 3-7. Charles G. Pyle, managing director, 500 Fifth Ave, New York 18, N. Y.

Electrical Manufacturer's Representatives Association of Michigan—Industrial Electrical Exhibit, Convention Hall, 4484 Cass Ave, Detroit, May 12-14. J. S. Ecclestone, chairman, 830 W. Vernor Highway, Detroit 1, Mich.

American Public Power Association—Annual Convention, Broadmoor Hotel, Colorado Springs, Colo., May 17-19. Carlton L. Nau, general manager, 1129 Vermont Ave, NW, Washington 5, D. C.

Arkansas Utilities Association—Annual Convention, Arlington Hotel, Hot Springs, Ark., June 14-15. R. E. Ritchie, secretary, Arkansas Power & Light Co, Pine Bluff, Ark.

PREVIOUSLY LISTED

National Electrical Manufacturers Association—Winter Convention, Edgewater Beach Hotel, Chicago, March 14-18.

Canadian Electrical Association—Western Conference, Palliser Hotel, Calgary, March 15-17.

Institute of Radio Engineers—Annual Convention, Hotel Commodore, and Radio Engineering Show, Grand Central Palace, New York, March 22-25.

American Institute of Electrical Engineers—Conference on Electron Tubes for Instrumentation and Industrial Use, sponsored by the Joint Subcommittee on Electronic Instruments, Benjamin Franklin Hotel, Philadelphia, March 29-31; Great Lakes District Meeting, Fort Des Moines Hotel, Des Moines, Iowa, April 1-3; North Eastern District Meeting, Taft Hotel, New Haven, Conn., April 28-30; Summer General Meeting, Palace of Fine Arts, Mexico City, Mex., June 21-25.

Southeastern Electric Exchange—Accounting Conference, Henry Grady Hotel, Atlanta, April 1-2; Annual Meeting, Boca Raton, Fla., April 8-10; Spring Conference, Engineering and Operating Section, Tampa Terrace Hotel, Tampa, Fla., May 6-7.

National Association of Corrosion Engineers—Annual Conference and Exhibition, Jefferson Hotel, St. Louis, April 5-8.

Edison Electric Institute—Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 6-8; Annual Convention, Hotel Traymore, Atlantic City, June 1-3.

Missouri Valley Electric Association—Engineering Conference, President Hotel, Kansas City, April 7-8; Rural Round Table, President Hotel, Kansas City, May 5; Sales and Rural Conference, President Hotel, Kansas City, May 6-7.

Midwest Power Conference—Sheraton Hotel, Chicago, April 7-9.

Northwest Electric Light & Power Association—Engineering and Operation Section, Davenport Hotel, Spokane, April 14-16; Accounting and Business Practice Section, Davenport Hotel, Spokane, April 17-18; Annual Business Meeting, Empress Hotel, Victoria, B. C., May 10; Business Development Section, Empress Hotel, Victoria, B. C., May 10-12.

Electrochemical Society—Spring Congress, Deshler-Wallick Hotel, Columbus, Ohio, April 14-17.

Southeastern School Lighting Institute—Suwannee Hotel, St. Petersburg, Fla., April 19-21; Exhibit, Mirror Lake Junior High School, St. Petersburg, Fla., April 19-May 15.

Missouri Association of Public Utilities—Annual Convention, Hotel Jefferson, St. Louis, April 28-30.

Engineers Club of Philadelphia—Engineering Progress Show, co-sponsored by junior members and the Franklin Institute at the Institute May 11-16.

Public Utilities Advertising Association—Annual Meeting, Hotel Cleveland, Cleveland, Ohio, May 27-28.

American Society for Testing Materials—Annual Meeting, Book-Cadillac Hotel, Detroit, June 21-25.

SEC RULINGS

UNITED PUBLIC UTILITIES CORP has been authorized to sell, as a step in its liquidation program, to Dayton Power & Light Co, for $7,830,000 all of the outstanding securities of seven wholly-owned Ohio subsidiaries. Dayton Power & Light Co expects to finance the purchase by negotiating a bank loan of $8,000,000. The subsidiaries are: Bradford & Gettysburg Electric Light & Power Co, Brookville & Lewisburg Lighting Co, Buckeye Light & Power Co, Eaton Lighting Co, Greenville Electric Light & Power Co, New Madison Lighting and Western Ohio Public Service. (Release No. 7984).

CENTRAL MAINE POWER CO, a subsidiary of New England Public Service Co, has received commission approval of its application to acquire for $653,470 all the 6,470 outstanding shares of common stock, $100 par, of Union Water Power Co. Central Maine plans to use its acquisition to obtain control of the storage reservoirs of the Androscoggin River. (Release No. 7985).

PUBLIC SERVICE CO of Oklahoma has received permission to sell at competitive bidding $10,000,000 of first mortgage bonds, Series B, due Feb 1, 1978. The offering price, interest rate and underwriting terms, will be filed by amendment. Proceeds from the sale of the bonds would be used to repay $3,075,000 of bank loan notes and to finance construction. (Release No. 7989).

LONG ISLAND LIGHTING CO has received permission from the commission to issue and sell to six insurance companies $12,000,000 of 3 percent first mortgage bonds, Series G, due Jan 1, 1958. Long Island will use the proceeds to retire promissory notes. (Release No. 7990).

WISCONSIN POWER & LIGHT CO, a subsidiary of North West Utilities Co, has been given authority to sell at competitive bidding $3,000,000 of first mortgage bonds, Series B, due 1978. The offering will also include 30,000 shares of 4.80 percent preferred stock, $100 par, to be sold at $100 per share to holders of record at Feb 16, 1948, of the presently outstanding 4½ percent preferred stock. Proceeds of the offering are to be applied to the prepayment of $2,750,000 of notes to banks with the balance to be used for new construction. (Release No. 7993).

CENTRAL NEW YORK POWER CORP has received permission to borrow $10,000,000 from 12 financial institutions on 2¼ percent promissory notes due on Dec 31, 1950. Central New York, a subsidiary of Niagara Hudson Power Corp, will use the proceeds for construction. (Release No. 7996).

EASTERN SHORE PUBLIC SERVICE CO of Maryland has been authorized to sell to its parent, Delaware Power & Light Co, up to $2,000,000 of 3½ percent promissory notes due Oct 1, 1973 and 20,000 shares of common stock, $100 par, the purchase price being the principal amount or par value, respectively. Proceeds of the sale of the notes and stock are to be used to finance Eastern Shore's construction program. (Release No. 8007).

Phil Sporn Plant Boilers Made for Best Heat Rate

Two boilers designed to help make possible the best heat rate yet attained in any steam-electric station are now under construction. They are being built by the Babcock & Wilcox Co for the new Philip Sporn Plant of the American Gas & Electric System at Graham Station, W. Va., on the Ohio River.

These radiant boilers from the point of view of net heat input, 1,300,000,000 Btu per hour, will be the largest boilers constructed up to this time. A net plant heat rate of 9,270 Btu per net kwhr output is expected with a boiler efficiency of 90 percent. The first boiler is expected to be in operation in 1949.

The boilers are designed to generate 930,000 lb of steam per hour at a pressure of 2,000 lb psi at 1,050 F and will be equipped with reheaters proportioned to handle 840,000 lb of steam per hour at 1,000 F.

The reheat cycle is expected to produce a kwhr for 5 percent less coal than a straight regenerative cycle using the same pressure and temperature. The primary superheater and the reheater will consist entirely of convection surface, which makes possible simplified design and operation with economical maintenance. A constant steam temperature over a reasonably wide range will be maintained by the use of B&W spray-type attemperators.

A feature of the boilers is the fact that they are planned for furnace pressure operation without the use of induced draft fans, which is expected to result in greater efficiency. The entire casing will be made tight for a furnace pressure of 15 in. of water.

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Shawinigan Moves Offices

Shawinigan Water & Power Co has moved its entire head office organization into its new home, the Shawinigan Building 600 Dorchester Street West, Montreal, Canada. Moving also are Shawinigan's subsidiaries and associates, Shawinigan Engineering Co, Shawinigan Chemicals Ltd, Shawinigan Falls Terminal Railway Co, St. Maurice Transport Co, and Canadian Resins & Chemicals, Ltd.

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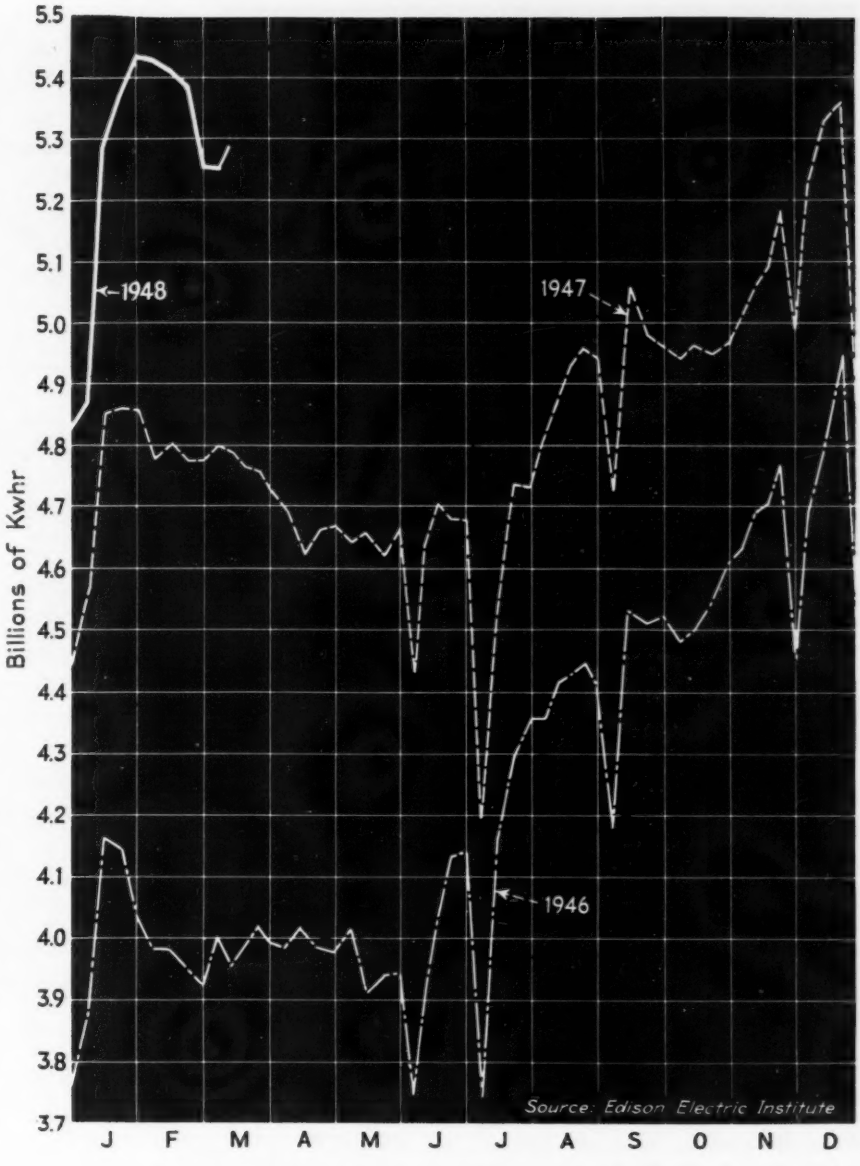
Enough Power Now

After a month of voluntary power rationing, customers of the Bangor Hydro Electric Co have been advised that normal power usage may be resumed.



Arput Gets Mad at Electric Utilities

The electric utilities better watch out. Arput, our output editor, is campaigning to put all overhead lines underground. He's pretty mad. Down in Arkansas, an owl friend of his flew into a live wire. Arput blames the utility.

"They're all alike," he fumed. "String live wires all-around. Innocent birds go flying into them—poof, no bird." So Arput is organizing a "kamikaze" flock. If those lines aren't down in a hurry, Arput will pass the word. Thousands of birds will dive into live wires. Poof, will go the birds. Poof, will go every distribution and transmission system. And output? Well it won't go up like it did last week.

Other News

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Weekly Output, Millions Kwhr

1948		1947		1946	
Mar. 6	5,293	Mar. 8	4,787	Mar. 9	3,953
Feb. 28	5,252	Mar. 1	4,797	Mar. 2	4,000
Feb. 21	5,254	Feb. 22	4,778	Feb. 23	3,923
Feb. 14	5,385	Feb. 15	4,778	Feb. 16	3,949
Feb. 7	5,412	Feb. 8	4,801	Feb. 9	3,983
Jan. 31	5,429	Feb. 1	4,777	Feb. 2,	3,983
Jan. 24	5,436	Jan. 25	4,856	Jan. 26	4,034
Jan. 17	5,370	Jan. 18	4,857	Jan. 19	4,145

Percent Change from Previous Year

	Mar. 6	Feb. 28	Feb. 21
New England	+11.4	+ 9.1	+ 9.5
Mid-Atlantic	+ 8.9	+ 4.3	+ 5.2
Central Industrial	+11.0	+ 8.4	+ 7.6
West Central	+10.1	+10.1	+10.3
Southern States	+ 8.7	+10.5	+11.4
Rocky Mountain	+12.0	+12.2	+14.3
Pacific Coast	+14.6	+16.1	+17.3
Total United States.	+10.6	+ 9.5	+10.0

WASHINGTON COMMENT

WILLIAM B. WHICHARD

ANYTHING CAN—and usually does—happen in an election year. That aged truism, however, affords only a partial explanation of recent developments in the fight over the vacancy on the Federal Power Commission.

When the President first named Burton N. Behling for the post last spring, the only serious protest came from conservative Senator E. H. Moore, of Oklahoma. Even after the nomination was resubmitted this year, the opposition continued largely as a one-man show. But now, supporting fire has come from an unexpected quarter.

Senator Joseph C. O'Mahoney, leader of a liberal bloc and possible Democratic candidate for vice president, is the added starter in the beat-Behling sweepstakes. His demand that the appointment be withdrawn just about settles the issue. O'Mahoney enjoys considerable prestige within his party as an expert on FPC matters. Democratic votes needed to confirm Behling will follow the lead of the Wyoming senator.

Senator O'Mahoney's views, as expressed in a letter to the President, stem from the year-old Congressional move to amend the Natural Gas Act. The Rizley bill, containing changes sought by the natural gas industry, was passed by the House last year. It has been stalled in a Senate committee ever since.

At the direction of this committee, FPC Chairman Smith and Commissioner Wimberly recently prepared a group of possible "compromise" amendments. The Commission held to its unanimous stand against the Rizley bill. Members Olds and Draper protested the "compromise."

The Smith-Wimberly proposals were based upon studies by FPC Aide Behling. Most important was a recommendation that FPC abandon original cost accounting in regard to regulation of one phase of the natural gas industry—production of gas by pipe line companies. Instead, the FPC would allow regulated companies going field prices for their own gas. They have been permitted such prices for that gas they purchase from non-affiliates.

Apparently it was this proposal, in the main, which aroused the ire of Senator O'Mahoney. He seems to view original cost accounting as the *sine qua non* of utility regulation. Regardless of the merits of this belief, it is fair to speculate as to whether the senator realized the effect his blast would have upon the Commission, an agency already divided against itself.

Withdrawal of the Behling nomination, if based solely on O'Mahoney's objections, would amount to repudiation of Commissioners Smith and Wimberly by President Truman. In that event, Smith could do little less than quit his chairmanship, if not the Commission. Wimberly could not expect reappointment at the end of his term in June and well might resign at once.

At any rate, no candidate Truman conceivably might pick to replace Behling would be any shoo-in for confirmation by the Senate. Republicans there are less likely to approve any further Truman appointments as a possible GOP victory in the November election looms ever closer. This inertia already has been an important factor in stalling the Behling nomination.

Democrat O'Mahoney simply has added his weight to a Republican road-block.

TECHNICAL TRENDS

ARCHER E. KNOWLTON

Carrier current technology is moving in two directions, apparently conflicting. Demand is growing for improved quality of speech over high-line carrier. Also sought is a volume gain sufficiently large and flexible to function well when PBX and other extensions are put in the circuit. Second trend is toward drastic simplification to permit application to lower voltage links and feeders. Reduced terminal cost is a prime necessity.

High-speed carrier also is wanted for telemetering and relaying on lines of 44 kv or less. Such refinements are essential for city system patterns that now include rings and multiple cross ties between energy sources.

Bushing power factor can be determined while the bushing is energized. An eastern utility is using a direct-reading modified and simplified Schering bridge for this purpose.

The 500-kv line has several implications. heretofore not too well covered in published discussions:

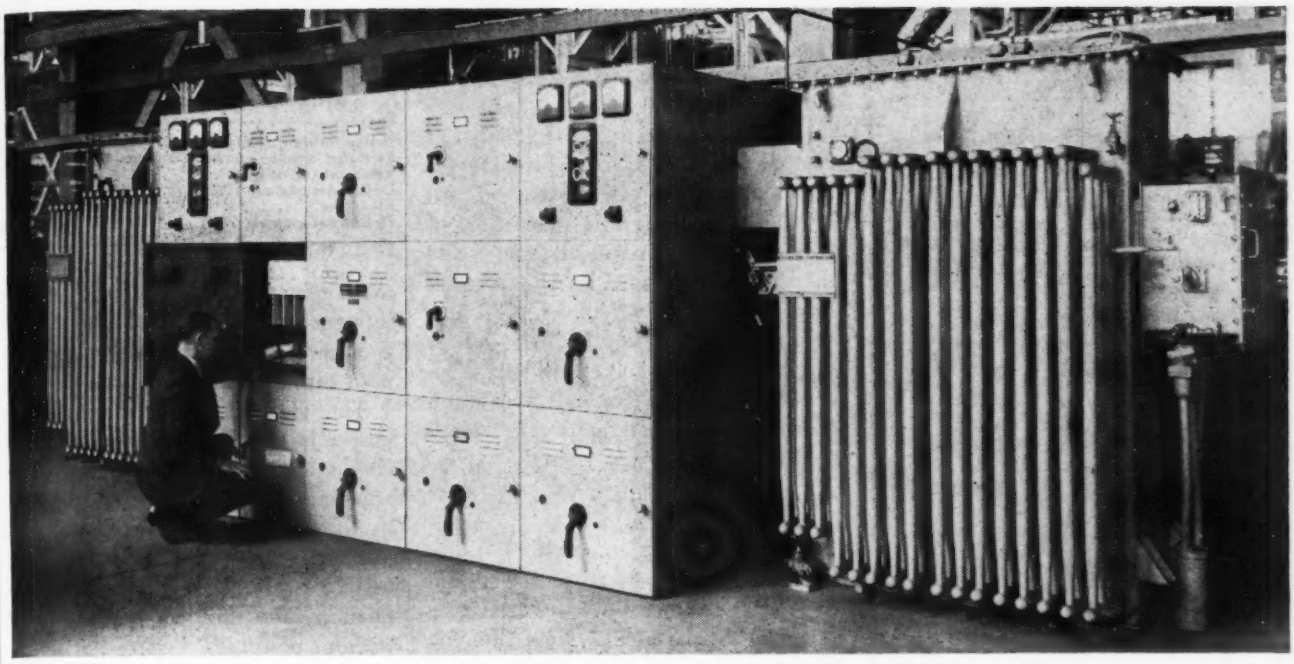
(1) Loads to support a voltage of 350 kv or more will have to exceed anything now in existence as to magnitude and concentration.

(2) Interconnections at terminals will require aggregations of back-up capacity capable of independent functioning.

(3) Ratings and dimensions of generators and main transformers must go up to attain necessary input requirements. Extension of present designs of 220 and 287-kv transformers appears possible. Resort to 22 or 33 kv would give generators the desired capacity. Mercury superposition could ease the turbine compounding problem.

(4) Circuit breaker ratings will go from 3½ to 8 or 10 million kva to meet the increase in short circuit potential. No difficulty is expected here.

(5) D-C transmission goes into eclipse as unsuited to U. S. A. conditions.



SECONDARY SELECTIVE operation of low-voltage switchgear, one feature of a 1500-kva 13,200-v to 480-v double-ended unit station

Better For The Power User?

H. J. FINISON
Industrial Power Division
General Electric Co
Schenectady, N. Y.

Reliable, flexible, industrial power distribution systems justify their cost in safety, less outrage, and operation ease

WHETHER ELECTRICITY is a large or small factor in cost of production, its continuous supply to manufacturing processes is important. One can choose between paying for adequate distribution facilities and possibly incurring greater losses by shutdowns.

One modern trend, learned from bitter experience, is planning in advance for changes and expansion. This has led to development of standardized components from which a power-supply system can be built to meet almost any industrial requirement. With these, less time is needed for engineering layout. Minimum erection labor also saves money.

Interrupting Capacity

Every circuit feeding a manufacturing area has a circuit-protective device which should be capable of prompt and safe opening in case of short circuit. Individual devices are usually grouped near a bus.

Amount of short-circuit current depends on the capacity of the system which supplies it. If the interrupting device fails to interrupt the fault current, severe damage can result to the device itself and the surrounding circuit breakers, possibly fire and danger to personnel. To be considered adequate, the interrupting device must stop current flow quickly without these risks.

TABLE I—Objectives

Reliability
Safety
Low Cost
Flexibility
Ease of Maintenance
Ease of Installation
Ease of Purchase
Ease of Operation

TABLE II—Methods

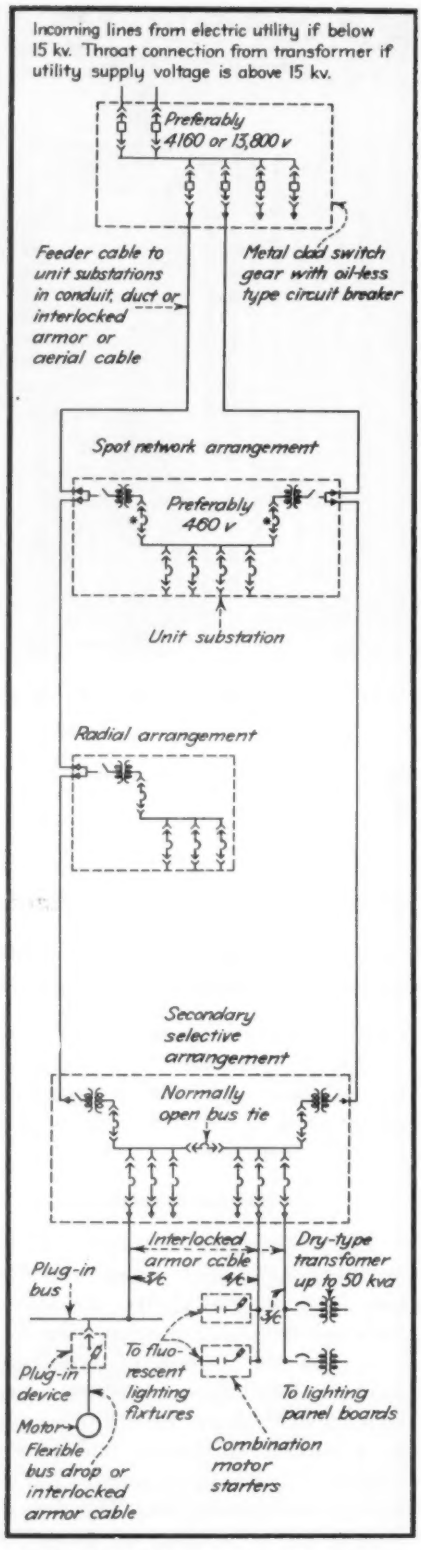
Adequate IC
Load-Center Principles
Choice of Proper Voltage
Proper Circuit Arrangement
Metal Enclosures
Factory-Assembled Packages
Elimination of Oil
Interlocked-Armor Power Cable
Plug-In-Bus
Combined Lighting-Power Supply
Grounded Systems

Load-Center Principles

The load-center has become an accepted method of power distribution for industrial plants. Its economies and flexibility are recognized.

In the old method of industrial power distribution, voltage was stepped down from the utility supply in a central substation and power carried at low voltage, usually 230 or 460 v, to utilization areas. This type of system has a number of disadvantages including (1) normal load currents at low voltage are high, requiring costly conductors and possibly excessive voltage drop; (2) short-circuit currents are high.

First requirement for a safe, reliable power system is that of protective switchgear of adequate interrupting capacity to clear maximum short-circuit current. In the typical old-style low voltage distribution sys-


Incoming lines from electric utility if below 15 kv. Throat connection from transformer if utility supply voltage is above 15 kv.
Preferably 4160 or 13,800 v
Feeder cable to unit substations in conduit, duct or interlocked armor or aerial cable
Metal clad switch gear with oil-less type circuit breaker
Spot network arrangement
Preferably 460 v
Unit substation
Radial arrangement
Secondary selective arrangement
Normally open bus tie
Interlocked armor cable
3¢
4¢
Dry-type transformer up to 50 kva
Plug-in bus
3¢
To fluorescent lighting fixtures
Plug-in device
Motor
Flexible bus drop or interlocked armor cable
Combination motor starters
To lighting panel boards

FULLY ADEQUATE industrial power systems can be made up of features illustrated in this partial one-line diagram

tems, available fault currents were usually high because of the large size of the source transformer, frequently of several thousand kva at 460 v. Therefore, to interrupt short-circuit current safely, expensive circuit breakers are necessary.

For example, the short-circuit current available with a 3000-kva transformer will approach 90,000 amp at 460 v. Circuit breakers suitable for feeder service for this size substation cost in the order of $1300 for a metal-enclosed, drawout-type circuit breaker. With a unit substation of 750 kva, short-circuit current is less than 25,000 amp and feeder circuit breakers cost less than $400. Thus, where a large number of feeder breakers are used, there is a real incentive to keep size of substation small. This is an important load-center principal.

Cost of Cable

Cable costs are frequently an important part of total power-system cost. Table III shows how voltage influences cost of cable. Note that the installed cost of 100 ft of 250 MCM cable, here used as an example, is higher at 4160 than at 460 v and the current-carrying ability is less due to the higher voltage stresses. Yet, the cost of the cable in terms of dollars for each kva that it is capable of transmitting is only $\frac{1}{7}$-th as great at 4160 as at 460 v. In addition, lower losses are obtained per unit of power transmitted at the higher voltage, and per unit voltage drop is less.

Our objective, then, should be to carry power at high voltage as close to the load as possible. This objective is accomplished by the load-center method of power distribution. Here, the power is carried at high voltage to load-center unit substations of 300- to 1500-kva capacity, which are located in or adjacent to the centers of load in manufacturing areas. Here it is transformed to the utilization voltage and delivered to the load by short secondary feeders. Since power is carried only short distances at low voltages, cable costs, losses, and voltage drops are low. The use of a larger number of comparatively smaller substations contributed to lower cost by reducing low-voltage cable lengths.

Studies have shown that in general the most economical size of unit substation for the 460-v system is usually 750 to 1000 kva.

Circuit Arrangement

Reliability of a power system comes partially from use of high quality equipment. However, the circuit arrangement used will also greatly influence potential reliability. At left is shown the three most commonly used circuit arrangements.

TABLE III

Influence of voltage on cable costs for a typical cable (three single-conductor, 250-MCM cables in steel conduit in a typical factory building)

System voltage, nominal	460	4160
Estimated installed cost for 100-ft run	$468	$547
Rated current, amp	243	218
Dollars per amp per 100 ft	$1.92	$2.63
Rated kva	194	1570
Dollars per kva per 100 ft	$2.40	$0.35

The simple radial system where power is supplied to the load over a single channel of supply frequently gives adequate assurance of continuity of supply. However, in the event of a primary circuit failure or transformer failure the load area supplied by the unit substation will be without power.

The secondary selective circuit arrangement gives a method of restoring power to any load area by closing a normally open tie circuit breaker between two otherwise independent unit substations. In some cases these units may be some distance apart, with a cable tie circuit between, or in others the unit may be built into a single structure and referred to as a double ended unit, as shown on page 97. The secondary selective scheme gives dual-channel supply and yet retains much of the low cost feature of the radial system.

In some cases, even the short time interruption of power necessary for closing the tie circuit breaker cannot be tolerated. In these instances, a spot network with two transformers normally tied to a single bus is a solution.

Secondary Network

The full secondary network wherein the secondaries of several substations are interconnected is sometimes used where a particularly high order of reliability is required, or where there are large shifts in the load at any one location in the plant from day to day or week to week. Of course, if several unit substations are interconnected, the available fault current on any one substation is considerably increased, and more costly circuit breakers of higher interrupting rating must be used.

Furthermore, every time a new unit is added the available short-circuit

current is increased, and there is always the question of whether the circuit breakers on existing substations are adequate. Thus, the secondary network system does not afford high order application flexibility, and since it is more costly than the radial, secondary selective, or spot network arrangement, it has not been widely used for industrial plants.

Selection of Voltage

In the load-center system we are interested in proper selection of two voltages: (1) utilization voltage; (2) primary or distribution voltage.

For the secondary voltage we are usually concerned with 3-phase supply to motors and similar utilization devices. These may be operated at 230 v, 460 v, or 575 v, although some special types of utilization equipment may definitely favor one voltage.

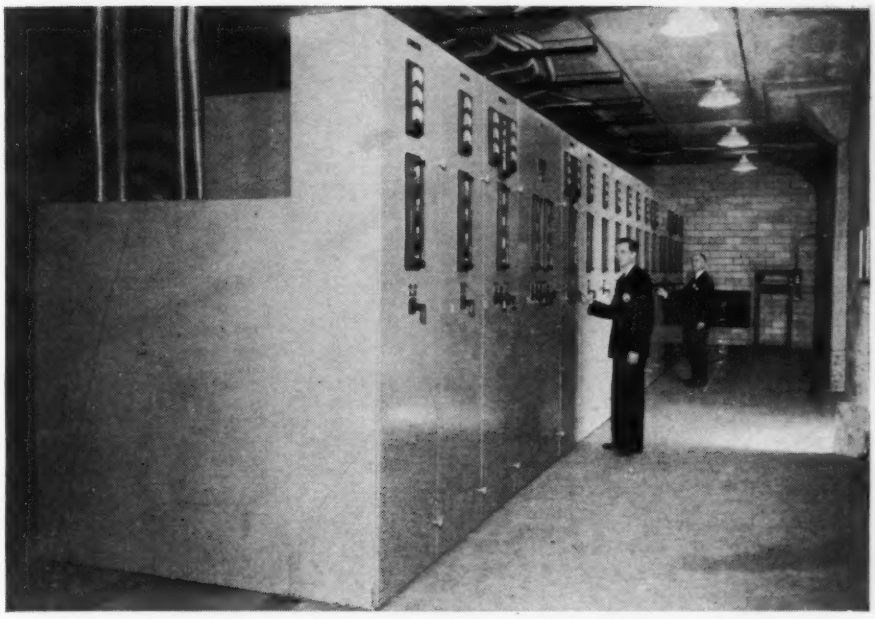
It is sometimes thought that the 230-v system should be safer than a 460-v system. However, accident records indicate no proven differences in the safety for the two voltage levels. All work on a system of *either* voltage level should be carried on with the system de-energized. Safety of either a 460- or 230-v system is a matter of proper installation and proper maintenance practices.

In general, the higher the secondary voltage, the lower is the total system cost. This factor tends to make the 575-v system slightly lower in cost than the 460-v system. However, 575-v utilization equipment is not extensively used except in a few areas in the country and in a few industries. The present widespread standardization on 460 v and its reasonably good economy in comparison with 575 v indicates that 460 v should be used for most new installations.

Present Trend

One example of the trend away from the 575-v level is illustrated by a practice of the General Electric Co. Many of the older GE plants used a 575-v secondary supply for factory areas, All of the new plants constructed, or now being constructed, use load-center unit substations for 460-v supply.

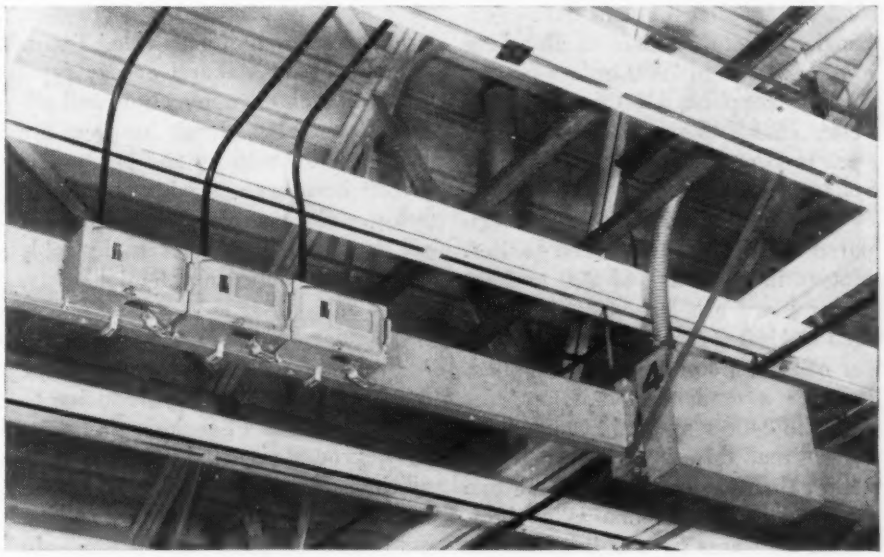
Selection of primary voltage is already accomplished for any industrial plant where power is supplied from utility lines at below 15 kv. Here the power company lines are taken directly into the plant in metal-clad switchgear and distributed at the utility voltage level to the load-center unit substations.



METAL-CLAD SWITCHGEAR in a large industrial plant combines operational ease and safety with convenience of well organized panel in minimum space

However, where the utility voltage is above 15 kv, a step-down to a lower voltage is usually made at the incoming point by use of a master unit substation. Voltages above 15 kv are not frequently used except for large industrial plants because of the greater cost of higher voltage equipment. In addition, the National Electric Code requires that for voltages above 15 kv equipment shall be located in a transformer vault and conduit or duct inclosed in two inches of concrete or brick. These limitations frequently mean higher costs for systems above 15 kv for the small or medium industrial plant.

Where the utility supply voltage is above 15 kv, the selection of plant distribution voltage is based on an economic study of the relative costs of systems using different voltage levels. A number of studies of typical systems have been made which may serve as a guide in selection of the



PLUG-IN BUS in an automotive plant is supplied by interlocked armor cable. Note three connections to utilization equipment

ELECTRIC POWER DISTRIBUTION SYSTEM in operation in the plant of a large motor manufacturer

primary voltage. These studies show that for plant capacity up to about 10,000 kva, 4160 v is almost always considered to be the most economical voltage level.

Above a plant capacity of about 20,000 kva, 13,800 v is the most economical level. Between these two sizes of plant capacity, either the 4160- or 13,200-v system may be the more economical. In some cases where future plant growth is indicated, the higher voltage level may be the most advantageous since it permits installation of switchgear with higher interrupting rating and thus allows a greater ease of future expansion. On the other hand, where motors of 200 to 2000 hp are part of the load supplied, 4160 v may be the better choice to permit operation of such motors directly at the primary voltage level.

The question of 4160 v as compared with 2400 v often arises. Motors in the range of 200 to 1000 hp or more are less costly at 2400 than at 4160 v. Hence, if a large number of such motors must be supplied, there is a tendency for lower cost with the 2400-v system. Studies have shown that this is true only if the 2400-v load is concentrated at one location and is supplied as an individual load area by a unit substation located near the load. For all other cases, 4160 v is usually more economical even though the motors themselves may be more costly. That is, there is sufficient saving in cost of distribution system switchgear and primary cables to more than offset the additional cost of the motors. In addition, greater allowance can be made for future plans for expansion at 4160 v.

Elimination of Oil

The presence of oil in transformers and circuit breakers has always been the source of potential hazard due to the inflammability of the oil. Modern practice is to eliminate the oil wherever equipment must be installed in or close to a building area. Transformers of the Askarel or dry type, depending on the application, and oil-less Magne-blast circuit breakers are being used for 15 kv and below. Air circuit breakers serve for 600 v and below. The complete elimination of oil from the system is a desirable objective to improve potential safety.

Metal Enclosure

Probably no single feature on the power system is more conducive to safety than that of enclosing all parts in a grounded metal enclosure. At all times there is a grounded conducting barrier between operating personnel and energized conductors. In modern distribution systems this includes metal-clad switchgear equipment, primary cable in conduit, or interlocked armor cable and the load-center unit with its transformer and metal-enclosed low-voltage switchgear. In addition the low-voltage circuits may be in conduit, interlocked-armor power cable, or metal-enclosed bus. Motor control equipment, as well as the conductors to the motors, may be metal-enclosed. Hence, from the incoming utility line to the terminal of the utilization device itself, all parts of the electric power system can and should be metal-enclosed.

Interlocked Armor

Interlocked-armor power cable retains the metal enclosure, which has just been discussed, for both high-voltage and low-voltage cables. Its flexibility makes for easy low-cost installation by permitting convenient routing through the frame of the building.

Plug-in-Bus

Plug-in-bus offers a safe, convenient way of making connections to the utilization machines. This type of low voltage distribution is particularly applicable in industries where utilization machines are being frequently changed. In these cases, the bus may be supplied from the load-center unit substation by way of interlocked-armor cable.

Factory Assembly

A modern industrial power system is assembled from a number of electrical "building blocks." Each "block" is a complete factory-assembled unit that incorporates all of the features necessary to perform the particular function. Metal-clad switch-gear or a unit substation are typical examples.

Probably the most outstanding feature of factory-assembled equipment is the saving in engineering time. Instead of the plant electrical engineer having to make complete detailed drawings of the location of each device that goes into the power system, he is able to lay out quickly the complete system in a minimum of time.

More important is the fact that standardization of factory-assembled equipment permits more careful and thorough engineering of each arrangement. For example, consider that the cost is $1000 to perform a

particular system function. If there is only one installation to be made, the amount of engineering that can be devoted to this $1000 installation is considerably less than the $1000. However, if a number of identical installations are to be made, considerably more than $1000 can be expended on engineering. A lower cost and better arrangement results from the expenditure of additional engineering effort. But the cost of that engineering can be spread over a number of installations.

Volume production of standardized designs results in concentrated engineering effort, which in turn results in a greater perfection of design and co-ordination than can be achieved in job-assembled equipments.

Factory assembly of equipment gives lower cost than on-the-job assembly because factory conditions are more ideally suited to the assembly. Specialized tools and manufacturing methods typical of mass production can be employed.

Space Saving

There is obviously a considerable saving in space by use of the factory-assembled equipments because of their greater refinement in design.

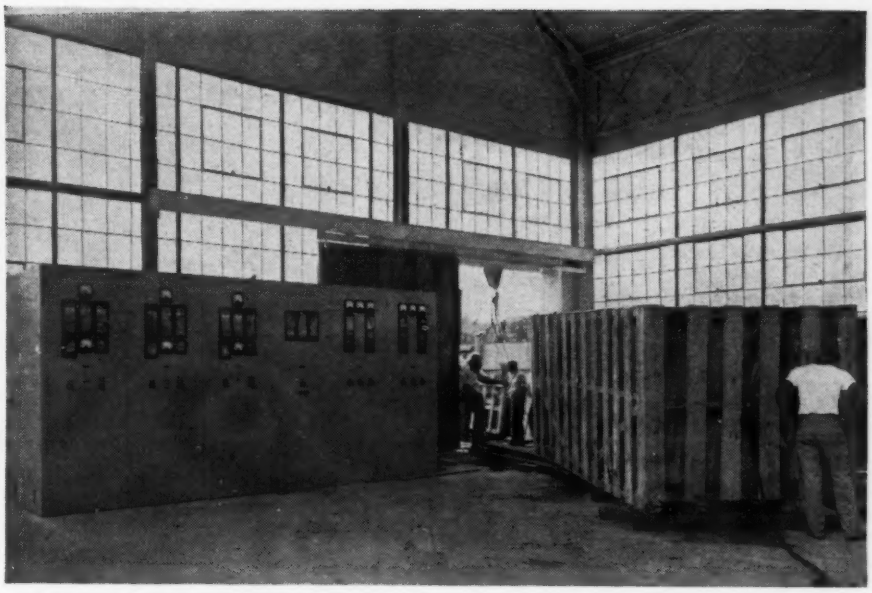
The use of small "blocks" permits a system to be changed or expanded readily without affecting the existing installation. This means a minimum investment in equipment at all times.

The factory-assembled units have high salvage values, since most of the cost is built into the equipment. Piece-meal, on-the-job equipments have much of their cost in the installation. Should the need arise to change location or sell the equipment, little of the original cost can be salvaged.

Factory-assembled equipments are easier to purchase. They are co-ordinated products and there is no need to itemize the components. The responsibility for the equipment is assigned to one supplier.

Combined Systems

Load-center systems are ideally suited to combined light and power service. Of course, a "first" requirement for such a combination is that power load must not produce objectionable flicker. Hence, lighting loads can seldom be supplied from a unit substation which also supplies power to resistance welders or to motors having high starting current.



METAL-CLAD SWITCHGEAR installed in power station and additional crated units entering for subsequent installation

There are two common methods of supplying lighting load from the 460-v power system: (1) dry-type transformers to supply lighting circuits; (2) wye-connected, 480-v system for supplying fluorescent lighting at line-to-neutral voltage of 277. Both these methods are indicated on the typical one-line diagram on page 98.

Either of these systems permits appreciable cost savings for supplying lighting load over that which would be encountered were the lighting load supplied by a separate substation. Of the two, the fluorescent lighting at 277 v is somewhat more economical and is ideally suited for lighting supply in wide-spread factory areas.

Grounding

Power systems are grounded in order to obtain savings through increased life of equipment, minimized service interruptions, reduced repair bills, and less hazard to personnel.

When the neutral of a system is not grounded, it is possible for dangerous transient overvoltages to occur under certain system conditions. Experience has indicated that these may cause failure of insulation at other locations on the system than the point at which the disturbance occurs. Thus a line-to-ground fault, which is one cause of transient overvoltage, may result in damage to equipment and interruption of service on other circuits. Grounding will reduce the transient overvoltages to a safe value.

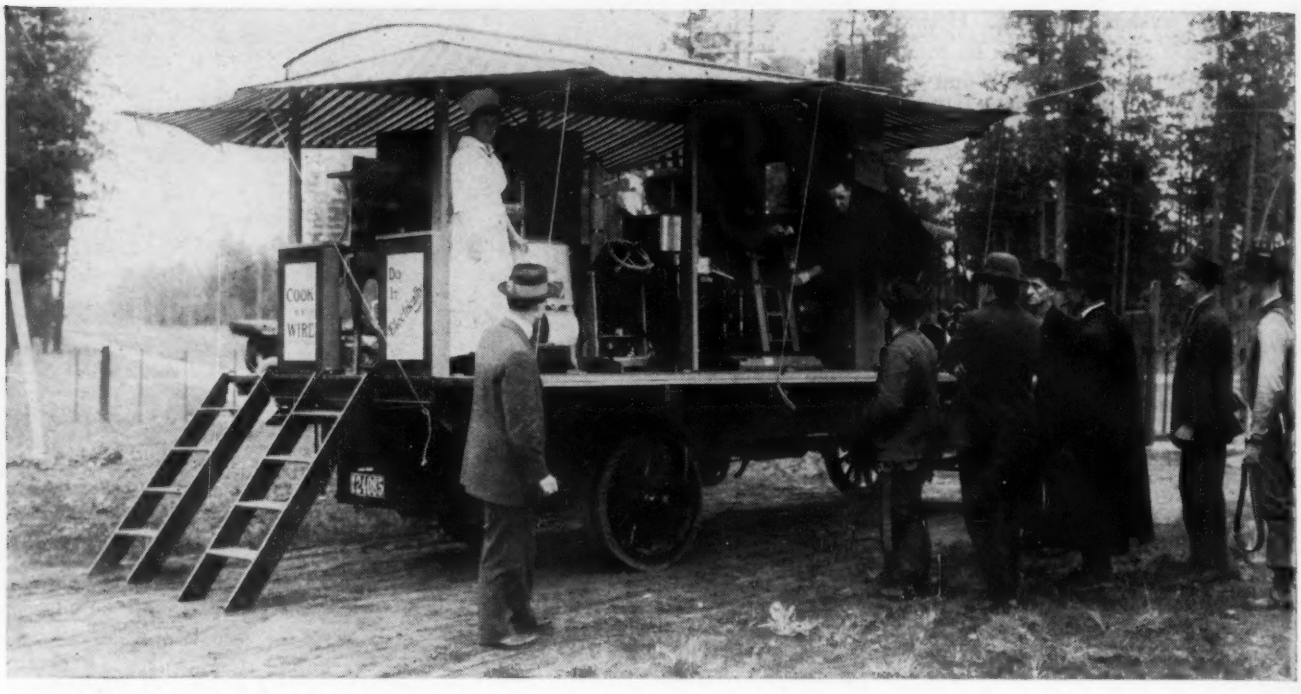
While transient overvoltages are more significant on high voltage systems, they do cause troubles on low voltage systems.

One other reason for grounding a system is to provide sufficient current in case of a line-to-ground short circuit for proper relaying in order to divorce the faulted circuit promptly from the system. On an ungrounded system, considerable time and effort may be involved in locating a line-to-ground fault.

Grounding of the 460-v system also permits its use for supplying fluorescent lighting on the line to neutral voltage, as has been previously discussed.

For high-voltage systems, the ground connection is usually made through a resistor in order to limit the ground fault current and thereby limit the damage that can occur in event of a line-to-ground fault. In low-voltage systems, the neutral of the transformer on the load center unit is usually solidly grounded in the interest of economy.

These methods permit achieving reliable, safe, yet low-cost and convenient power systems. While they are modern, they are by no means new or untried; they have a full background of experience which points to their effectiveness in promoting ever-increased use of electric power in manufacturing plants and factories.



THE IDEA ISN'T NEW. This photo, published in the July 3, 1915 issue of *Electrical World*, shows a traveling kitchen exhibit that was put on the road by the Washington Water Power Co to demonstrate the wonders of electrical cooking, churning, washing and water pumping. But judging from the potential customers' facial expressions, a certain amount of skepticism prevailed

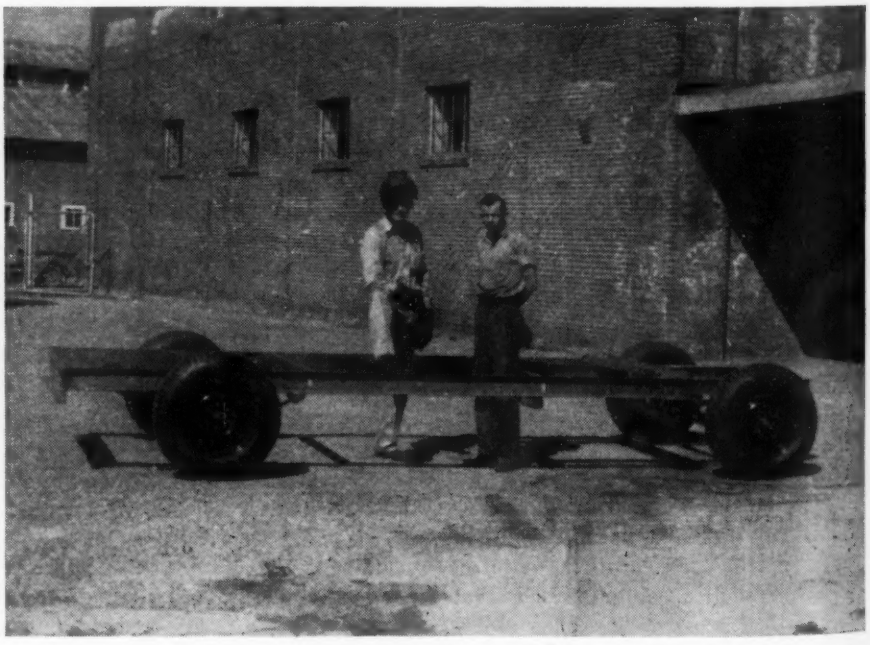
Electric Kitchen Takes To The Road

Power company builds complete electric kitchen on a trailer to spread message of electrical living over service territory

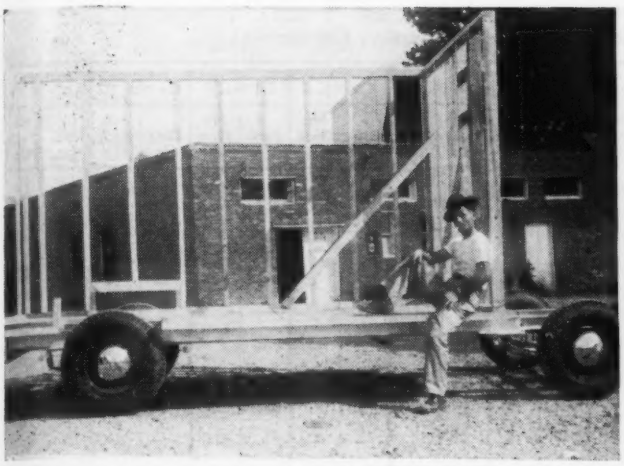
CUSTOMERS of the Central Louisiana Electric Co are going to see what a modern electric kitchen is without having to travel very far to look at it. It will be brought to them. It will visit every town, hamlet and four-corners the company serves. It is not just a "look at" kitchen either. Everything in it works.

The kitchen is mounted on a trailer. It is equipped with a full-size electric range, an 8-cu ft refrigerator and a home freezer of the same size, a 30-gal table-top water heater, a combination dishwasher sink with disposal unit, ventilating fan, and fluorescent and incandescent lighting. The unit was designed by, and built under the supervision of R. T. Nash, sales manager of the company.

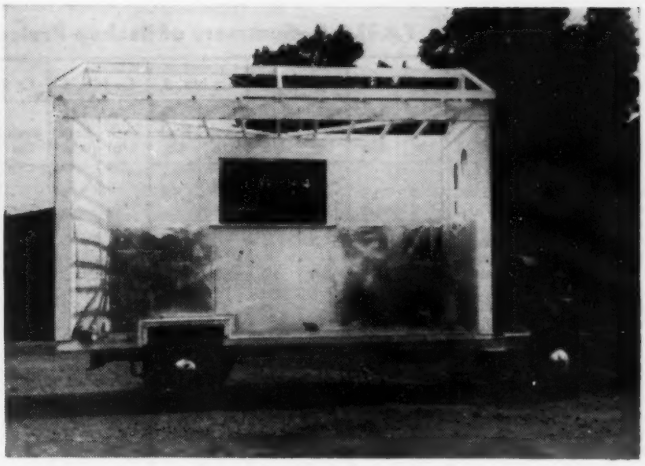
The trailer rolls into a town and is parked at a selected location. Connection is made to a fire hydrant for water supply. A lineman drops a set of leads from the secondaries on a nearby pole. The canvas side is rolled up and the demonstrators are ready to roast chickens, grill pork chops and bake pies and cakes.



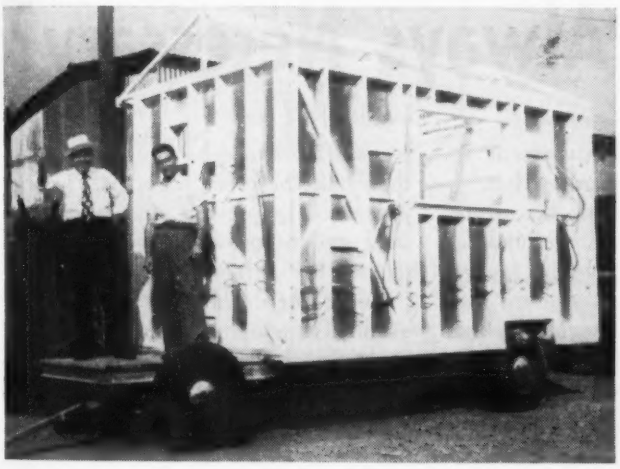
1 THE CHASSIS, except for wheels, springs and front axle, was constructed of scrap steel from company junk piles. W. A. Guinn and V. H. Ridge, company garage employees, did the job under the supervision of R. T. Nash, sales manager



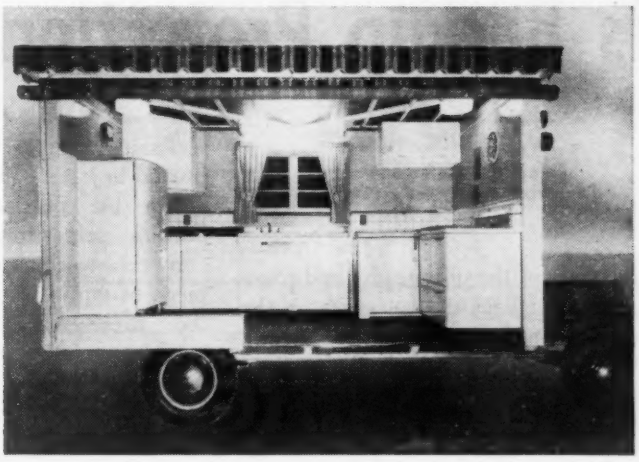
2 GOING UP. Platform and wall studding in place. His relaxed pose belies the hard work that H. G. Rabalais, appliance service manager, put into construction of the trailer



3 WALLS ERECTED and frame in position for roof of green and gray awning. The Barkley Board (imitation tile) in the corners is masked with paper for protection during spray painting



4 WIRING INSTALLED. C. R. Cox, appliance specialist, registering enthusiasm, and Mr Rabalais, not so relaxed as before, lend the human touch to a view of the unfinished exterior. Walls were finished with regular siding and painted white



5 FINISHED AND READY for the road, the trailer-mounted kitchen includes a full-size electric range, refrigerator, home freezer, table-top water heater, combination dishwasher sink with disposal unit, ventilating fan and modern lighting

6 STATION WAGON used to pull the trailer tells the electric story, too, by means of varied advertising messages prominently and advantageously displayed on all door panels and at roof top

7 AT BUNKIE AND VILLE PLATTE SHOWINGS, 30-minute radio programs were transcribed with "Jelly Elliott's Singing Cowboys" giving a hand to Reddy Kilowatt

TABLE I—Summary of Backup Protection Practice of Reporting Companies

Equipment	Co No. 1		Co No. 2		Co No. 3		Co No. 4		Co No. 5		Co No. 6		Co No. 7		Co No. 8		Co No. 9		Co No. 10		Co No. 11	
	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up	Back Up	No Back Up
Main Generators	0	19		5		17		2*				5		9		6		24	2	16	21	14
Frequency Changers	3	0													2						14	
Auxiliary Generators		2										1		1		1		5		5		1
Synchronous Condensers			3																			8
Generator Station Busses		4				14								7				38		16	18	18
Main Power Transformers (L.T.11Kv or Over)	26	10	14	10	0	28	4	3			18	6	4	14	14			29	24	10	80	20
H.T. Sub Busses	2			6	36			13				2		17	10		Yes			1		
H.T. Terminals:																						
66 Kv & Over	28		18		60		4	12	5			26	10		100		56		32	4	44	13
33–45 Kv Terminals													38					37				109
22–25 Kv Terminals				45	244			38					2				94	52		94		
11–13 Kv Dist. Feeders	27											18	24	8	150		Yes			44		
2.3–4 Kv Dist. Feeders				79	218							36					Yes					
Main Dist. Transformers							1	33				45								42	39	48
House Transformers	1	5																10				
Converters																						2

* Over-current while synchronizing

Is Backup Protection Always Necessary?

W. L. RIDENHOUR
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A STUDY of the philosophy and practice of backup protection on the systems of eleven Pennsylvania utilities, conducted by the Relay Subcommittee of the Pennsylvania Electric Association, indicates that:

1—Failures of relays and their auxiliaries are too infrequent to justify separate relays on a given piece of equipment, except under special conditions, as will be indicated.

2—Wherever possible, advantage is being taken of the backup protection provided by relays on adjacent equipment or by relays designed to care for some special kind of fault.

3—Where applications are of importance to the operation of the system, or where relay systems of the carrier or differential type are used, separate backup relays are often justified. One justification for separate relays often used is that they may serve as primary protection when the high-speed feature is out of service.

4—In about half the cases where separate backup relays are provided, they protect only against failure of the primary relays.

The accompanying tables summarize the results of the survey. Table I classifies the practice of companies as to the number of equipments with and without backup protection.

Table II gives the equipment reported to have backup protection.

For the purposes of the study backup protection was defined as "any relays which will clear a faulted piece of equipment in the event that the protective equipment, which would normally clear the fault, fails to operate. These relays may be connected so as to protect the faulted component only, or may have as their primary purpose the protection of an adjacent or remote component."

Relays Having Backup Protection

The study showed that relay systems which provide no inherent backup protection are more frequently provided with separate backup relays than over-current or distance relays, which provide protection to adjacent equipment.

Directional distance carrier current systems are invariably provided with backup protection, either from second and third zone elements of the associated distance relays or from separate relays. Phase-comparison carrier systems are provided with separate backup relays. This appears to be a matter of emergency relaying when the carrier feature is out of service. It is also for protection of adjacent line sections rather than to insure against failure of primary relaying. Current-balance and pilot-wire applications are frequently "backed up".

Differential systems, as applied to transformers, are backed up in more than half the cases reported. This is presumed to prevent sustained overload and to provide secondary protection for adjacent equipment.

Generator differential protection is usually considered adequate. Here protection against overload is probably neither desirable nor necessary. It appears that special overcurrent relays might be of service (1) where machines are connected to buses having no primary protection and (2) as insurance against failure of primary relaying in the case of important machines.

With the exception of transmission lines that are equipped with carrier, pilot-wire, or current-balance type protection, backup is furnished by relays connected to buses, transformers or adjacent line sections.

Experience has apparently shown that failures of relays and their auxiliaries are too infrequent to justify duplication of relays except in rare instances. Failures could occur in many different places. But, since it is difficult to pick any one element more subject to failure than others, complete backup relaying would often require almost complete duplication of facilities. This would lead to added complication, increased risk of overtripping and exposure to equipment failure.

All companies have taken advantage of the fact that relays on one piece of equipment may serve for ad-

jacent equipment. This is usually complete protection against equipment failure since separate relays, instrument transformers, trip circuits, and oil circuit breakers are involved. The only disadvantage is the probable loss of more equipment than necessary to clear the fault when this backup system is called on to operate.

Criteria for determining just what it is that backup protection does "back up" were laid down by one reporting company as follows:

1—To provide backup protection in the event of relay failure it is only necessary to have a separate backup relay.

2—To provide backup protection in the event of a trip-circuit failure the primary and backup relays should be energized from different sets of instrument transformers.

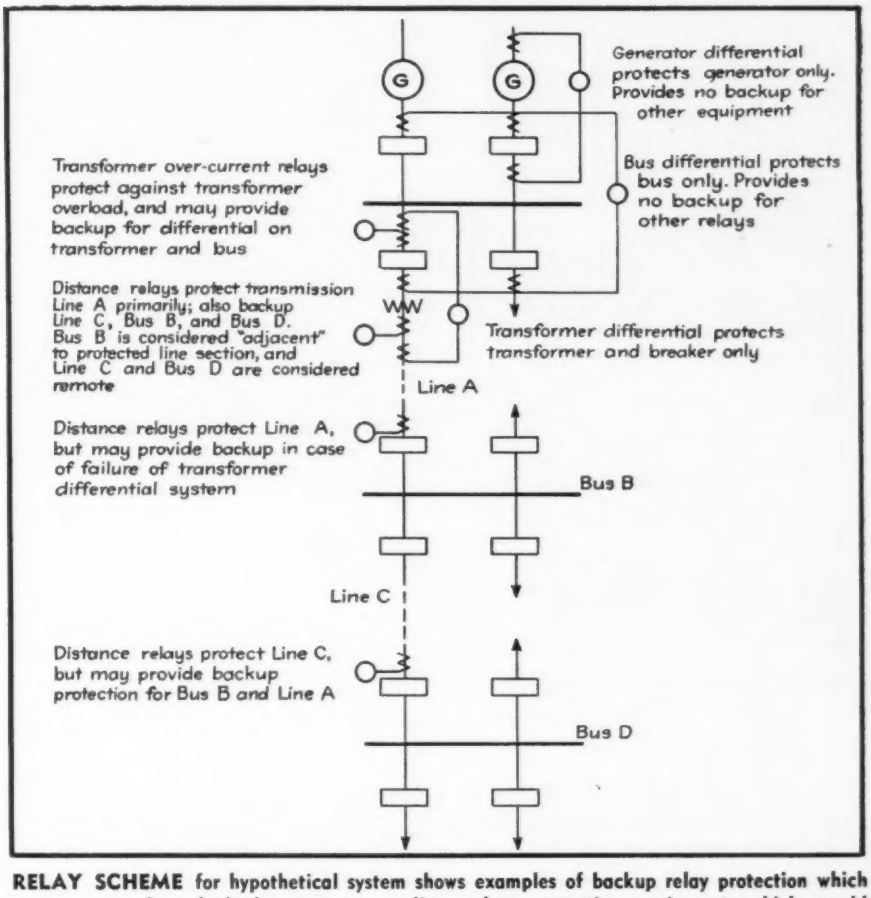
3—To provide backup protection in the event of a trip-circuit failure the primary and backup relays should use independent trip circuit and breaker trip coils.

4—To provide backup protection in the event of a circuit breaker failure, the primary and backup relays should trip different circuit breakers.

It is believed that all reporting companies used similar reasoning in providing information for the study. One possible difference may arise in connection with trip-circuit backup. (No. 3 above) At least one company assumed that the trip-circuit was backed up if the primary and backup relays receive their tripping potential from separately fused branches of the same battery bus, and operated the same oil circuit breaker trip-coil through different auxiliary relays. In this case a trip-coil failure would be considered as a circuit breaker failure.

The scope of the backup protection that was provided in cases where backup relays were installed is indicated in Table III.

As would be expected, Table III shows that over 50% of the backup relays provided only against failure of the primary relay itself. The majority of those desiring to provide more complete protection included everything except the oil circuit breaker. Obviously, it is difficult to provide against oil circuit breaker failure except by falling back on adjacent pieces of equipment.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Generator differential protects generator only. Provides no backup for other equipment
Bus differential protects bus only. Provides no backup for other relays
Transformer over-current relays protect against transformer overload, and may provide backup for differential on transformer and bus
Distance relays protect transmission Line A primarily; also backup Line C, Bus B, and Bus D. Bus B is considered "adjacent" to protected line section, and Line C and Bus D are considered remote
Transformer differential protects transformer and breaker only
Line A
Distance relays protect Line A, but may provide backup in case of failure of transformer differential system
Bus B
Line C
Distance relays protect Line C, but may provide backup protection for Bus B and Line A
Bus D

RELAY SCHEME for hypothetical system shows examples of backup relay protection which operates to clear faulted apparatus or lines when protective equipment, which would normally clear a fault, fails to operate

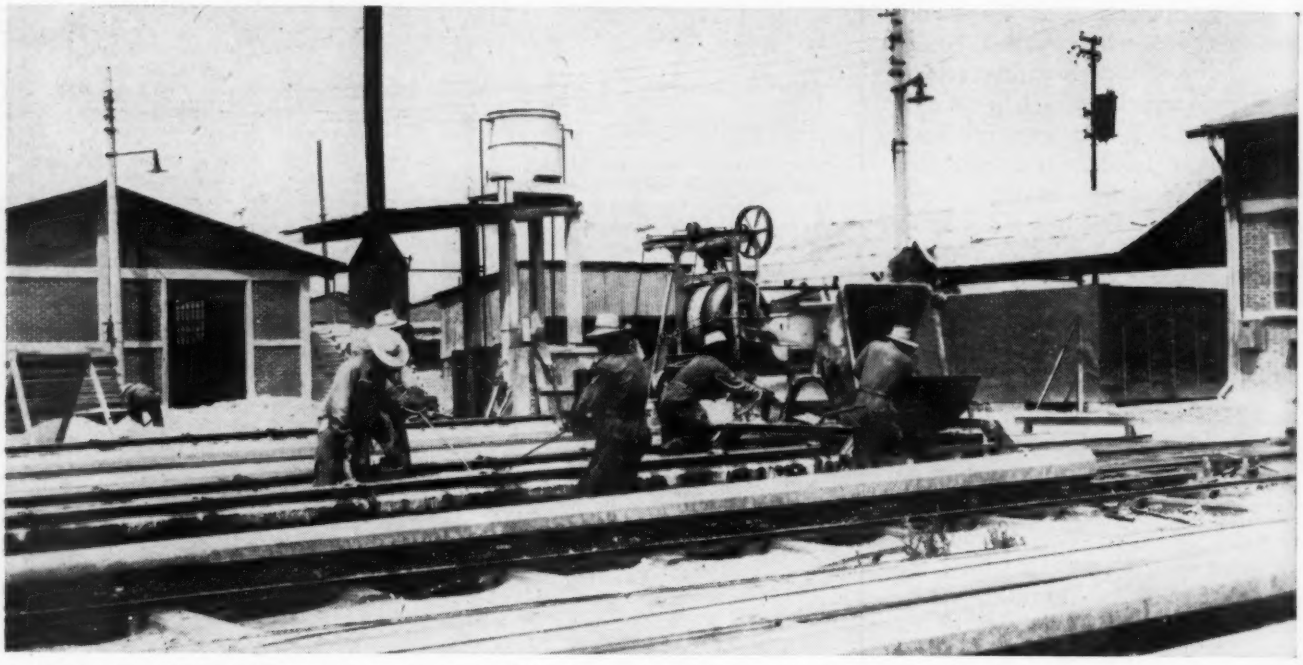
TABLE II—Application of Backup Protection to Specific Equipment

Equipment	Approximate No. Reported	No. Having Backup Protection	Percent Equipped with Backup Protection	No. Having No Primary Protection
Main Generators	140	23	16.4	2
Frequency Changers	19	19*	100.	
Auxiliary Generators	16	0	0	
Synchronous Condensers	11	0	0	
Generator Station Busses	115	18	15.7	25
Main Power Transformers (L.T. 11 Kv or Over)	314	184	58.6	
H.T. Sub. Busses	87	48	55.2	25
H.T. Terminals (66 Kv & Over)	414	357	86.2	
33-45 Kv Terminals	184	38	20.7	
22-25 Kv Terminals	569	340	59.8	
11-13 Kv Dist. Feeders	271	201	74.2	
2.3-4 Kv Dist. Feeders	333	218	65.5	
Main Dist. Transformers	208	40	19.2	
House Transformers	16	1	6.3	

* 3 Motors Have No Backup

TABLE III—Scope of Protection Where Backup Relay Protection is Installed

		No. Cases Where Backup Is Provided For:				
Co No.	Total Cases Reported	Relays, Inst. Tr., Trip Cir., O.C.B.	Relays, Inst. Tr., Trip Cir.	Relays Inst. Tr.	Relays Trip. Cir.	Relays Only
1	74	1	73			
2	19	19				
3	23					23
4	10					10
5	5					5
6	18		18			
7	7	7				
8	14			14		
9	28					28
10	64		64			
11	226	8		25	4	189
Total	488	35	155	39	4	255
Percent	100%	7.2%	31.8%	8.0%	0.8%	52.3%



POURING YARD of the Mexican Light and Power Co Ltd, where workmen are shown pouring concrete into forms for poles

Use Of Concrete Poles In Mexico

JULIO COLON
Mexico City, Mexico, D. F.

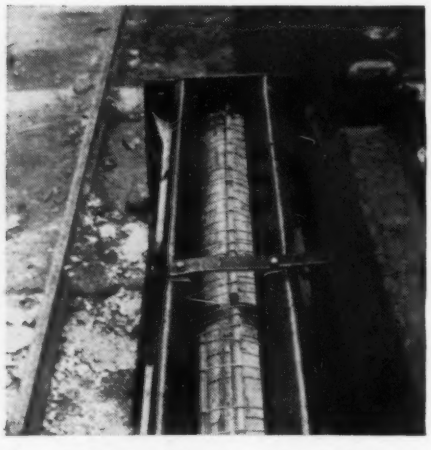
Short life of wood poles in tropical regions of Mexico coupled with the scarcity and high price of structural steel has forced utilities to develop and use hollow concrete poles for a variety of applications. Here are a few

IN MEXICO, the extensive use of reinforced-concrete poles springs from the scarcity and high price of structural steel shapes and the short life of wood poles in tropical regions where preservatives are not as effective as they are up north.

Although it requires considerable "know-how", a relatively simple method of fabricating concrete poles is being used in Mexico. Here, poles are cast in a horizontal form consisting of a tapered steel trough that is provided with a central core which is removed when the concrete has set.

This core is a tapered, steel-covered wooden mandrel that is centered in the trough. The larger end is provided with a pulling ring and pro-

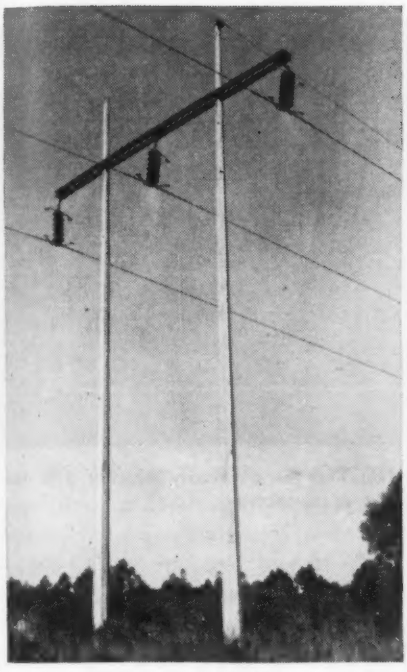
STEPS IN FABRICATING CONCRETE POLES



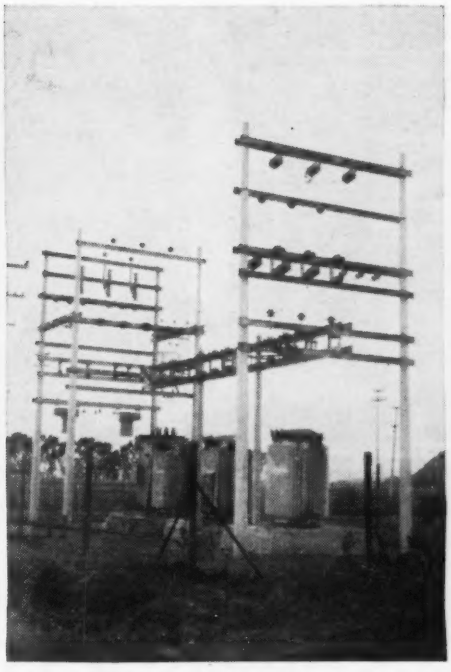
1 TROUGH FORM with tapered, steel-covered wooden core in cage of reinforcing steel. Core is easily removed

2 FORM IS FILLED and concrete compacted. Upper pole face is smoothed by hand. Mix used has high water-cement ratio

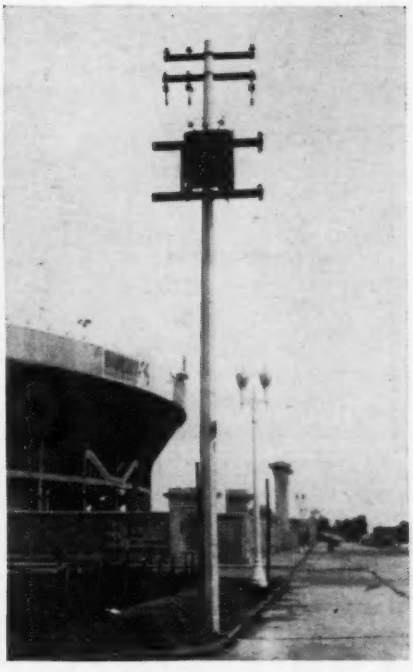
3 FORM IS REMOVED after the greased core is pulled. Plug seals pole cavity, which is water-filled during curing



H-FRAME CONSTRUCTION for an 85-kv line built with concrete poles. Ground lead enters pole through ¾ in. hole below crossarm



SUBSTATION STRUCTURE built with concrete poles and steel channels. Wood does not stand up under the tropical weather



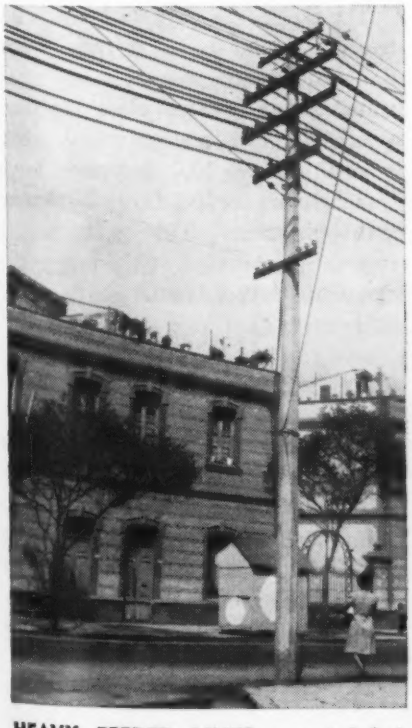
TRANSFORMER POLE of concrete supports 3-phase unit on structural steel channels clamped to pole with encircling U-bolts

trudes through the end of the trough. Surface of the core is coated with grease and the reinforcing cage placed around it. Care is taken to insure that a sufficient thickness of concrete covers the reinforcing cage of the finished pole.

The cage of a 45-ft pole consists of six $\frac{5}{8}$-in. vertical rods alternating with six $\frac{1}{2}$-in. vertical rods. All vertical rods are fastened to a number of transverse rings. A spiral of 3/16-in. wire wound on the outer part of the vertical bars, completes the cage. Hard steel is used for the cage in lieu of reinforcing grade stock.

After concrete is poured into the trough, it is jarred and vibrated to force the concrete into the interstices of the cage. The concrete mix that is used has a relatively high water-cement ratio.

One trough and core assembly is required to cast one pole in 24 hours, although by using hot water and hot aggregate, the equipment can produce one pole in 12 hours.



HEAVY FEEDER LINES supported from steel arms on concrete pole

SIDE-ARM PRIMARY circuit with secondary circuit carried on pole rack

SECONDARY RACK and service drop located in residential area

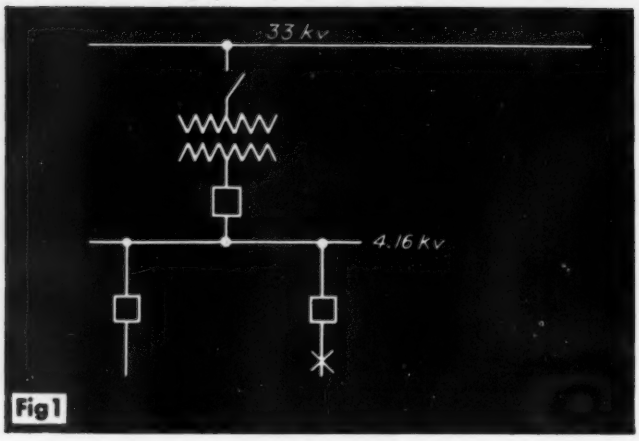


Fig 1

"BASE CURRENT" for further calculation is the 3-phase fault value at terminals of one radially supplied breaker

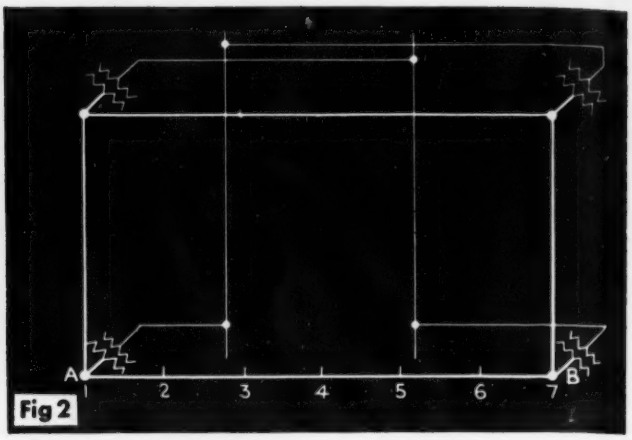


Fig 2

SUBSTATIONS CONNECTED in a primary network with line for study divided into six equal sections

Fault Currents Estimated From Curves

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Curves plotted from calculating board study can be applied to any particular grid or network with fault current at one point used as base

CALCULATION of short circuit currents in networks is becoming of much greater importance and frequency with the use of small distribution substations at load centers, tied together in various ways. A simple and quick method of determining currents available at any point on a loop or grid, in changing from the radial system, would therefore be of practical help. An approximate method has been obtained with the aid of a network calculator and is summarized in the accompanying charts.

Starting point in this method is the "base current" of a 3-phase fault at the terminals of one breaker. Short circuit current at any point is determined in terms of percentage of this base current value for the particular system under consideration. The other coordinate in the curves is the ratio of line reactance to the transformer reactance in percent of a common kva base.

Basis of Curves

Development of the network starts with the simple four-sided loop, around which may be added other loops. Data for the curves were obtained with networks in perfect symmetry or equal spacing between transformers of the same kva rating. These symmetrical case results can be modified to fit any particular case.

The use of X_L, reactance component of line impedance, and X_T, transformer reactance, in the ratio X_L/X_T permits the application of the original data to most network systems. The impedance angle for the size of line normally used in this type network is about 65 deg, so that the length of line may reasonably be measured by reference only to the reactance component of its impedance.

If the X_L/X_T ratio is varied, it can be used to simulate any combination of line length and transformer rating. For example, if the line reactance is 54% and the transformer reactance is 60% the X_L/X_T ratio is 0.9. These values are both on a 15,000-kva base for one mile of 4/0 copper wire overhead and 1,500 kva transformers. If the ratio is 1.8 this would indicate two miles of line between transformers of the same size. Another example having the 0.9 ratio would be 750-kva transformers spaced two miles apart with 108% for X_L and 120% for X_T. (Both transformers assumed to have 6% reactance on their own bases).

The range of X_L/X_T studied was between 0.6 and 16.0 A ratio below 0.6 indicates the use of many small transformers located close together, which becomes uneconomical, while a ratio above 16.0 indicates large transformers feeding large loads over great distances. This again proves impractical because of the large voltage drops encountered.

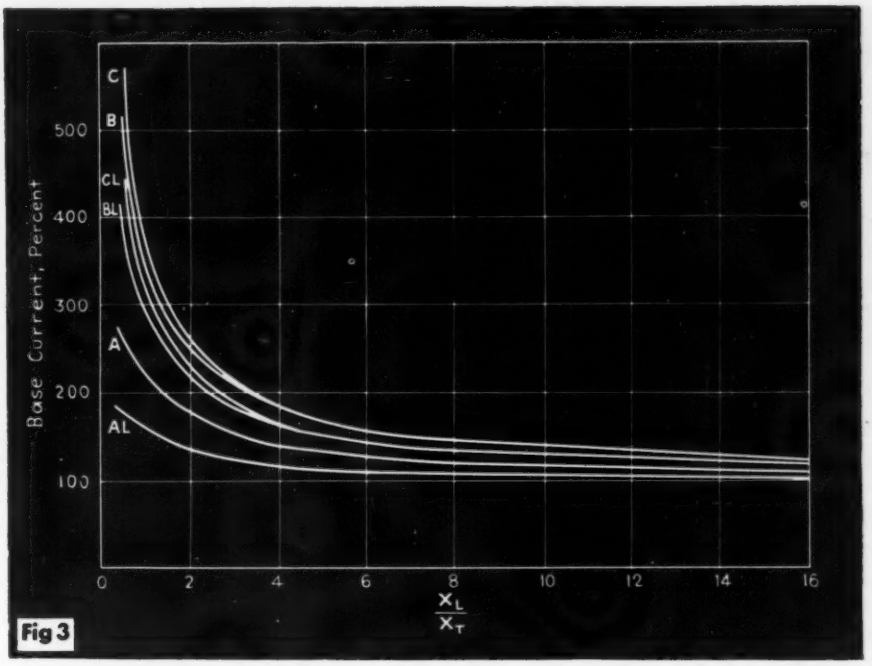
Curves Plotted

In Fig 2, line section AB is divided into six equal sections. Curves are plotted for faults at points 1 through 4. Due to symmetry, faults at points 5, 6 and 7 correspond to faults at points 3, 2 and 1 respectively. Faults on this line section give the maximum short circuits obtainable and would, therefore, determine the breaker sizes used in the network.

The maximum fault current in the line section under consideration (Fig 3) occurs at the terminals of

the transformer, either points 1 or 7. This fault condition will therefore determine the breaker sizes necessary. Fig 4 to 6, which give values of fault current for faults at points 2, 3 and 4 respectively, help determine the fuse or circuit breaker sizes for taps off at these points.

Curve A on each of the charts refers to the short circuit current for the initial network as shown in Fig 2. With a second loop added around the first, values shown on curve B are obtained. Effect of a third loop is shown in curve C, and since its addition to the short circuit current is negligible, no further loops are necessary in the calculations. Curves A_L, B_L and C_L each indicate the part of the total short circuit current through the breaker on the left, or nearest the fault.



THREE PHASE FAULT VALUES at point 1, which are the maximum, determine the breaker sizes for the network

Example of Curve Use

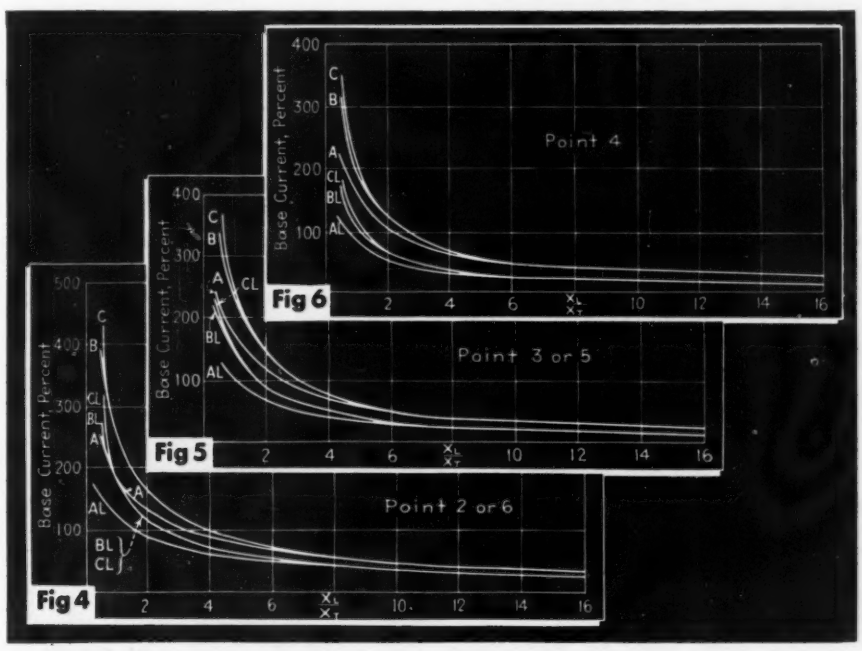
Application of these curves is shown by the following example. Four 2,000-kva substations are tied together to form a loop. The distances between successive stations are 1½, 2, 2 and 1¼ miles. The faults in the 1¼-mile line section will give the largest values, and will therefore be the line studied. The lines are 4/0 copper with 3-ft symmetrical spacings giving an impedance of (24.1 + j 54.0)%. The transformers have 5.75% impedance on their own base or 43.2% on a 15,000-kva base.

The base current or kva is 17.4 times normal, assuming infinite capacity behind the 2,000-kva transformers. From the curves for case A and an X_L/X_T ratio of $\frac{54 \times 1.25}{43.2} = 1.56$, the short circuit is 190% of the base current. The short circuit kva is 1.9 x 17.4 x 2,000 = 66,000 kva; the amount of this total fault through the left hand breaker is 150% of base or 1.50 x 17.4 x 2,000 = 52,000 kva. This indicates 100,000 kva I. C. breakers, since the next smaller size of 50,000 kva I. C. is inadequate.

This data assumes a network of 1¼ miles square and gives values of short circuit current slightly larger than would be encountered, since the adjoining sides are 2 miles and 1½ miles long. However, if the 2-mile line had been studied, the assumption would have been that the network is 2 miles square and the short circuit currents would have been too low.

For example, the X_L/X_T ratio for the 2-mile line section would have been $\frac{108}{43.2} = 2.5$. For this ratio the short circuit current is 160% of "base current." The amount of short circuit current through the left-hand breaker is 130%. In terms of kva the total fault kva is 56,000 kva and the amount of short circuit kva through the breaker is 1.3 x 17.4 x 2,000 = 45,000 kva. This brings the breaker rating down one size but would not give the true picture because 100,000-kva breakers were shown in the previous analysis for the 1¼-mile line section.

Caution should be taken in using these curves in choosing the right X_L/X_T ratio. This caution applies not only to networks with different lengths of line but also with unequal transformer ratings. Attention must be given to the future network growth when choosing the breaker size.



THREE-PHASE FAULT VALUES shown for taps at points 2 and 3, may also be used for points 6 and 5 respectively. Point 4 values are at the line center

Don't Sell Utility Equities Short

THE EQUITY securities of electric utilities seem to have lost favor. Some of you analysts have been telling investors that our equity securities lack appeal. You may be right, but here's the other side of the story.

Our industry got a public laundering by the Federal Trade Commission. Until the late thirties, your approval of our equities was about what we deserved. But after the war, your affections for our securities was great. Some of us sold bonds on a 2.5 percent basis, preferreds at 3.5, and common at 4.5 percent. On this basis, compliance with the Holding Company Act was accelerated. Perhaps too many of our equities reached the market too quickly.

Then investors began to realize that electric utility capacity margins were thin. The demand surprised some of us. Today, our business is good. Our revenue prospects are bright. We must expand, and we must do it when equities are less favorably received.

We Sell For 1940 Dollars

Rising costs have troubled us. Most of us sell our wares at about 1940 dollars. But we pay for purchases and labor with 1948 dollars. Fortunately, most of us refunded bonds and preferreds advantageously. Our operating costs have risen out of proportion with revenue increases. Despite this, we have been able to hold income available for equities fairly level. Many have improved it.

As for rate increases, I can describe general policy. Our record shows we have a strong interest in promoting consumption and cutting rates where this will help. But because of inflated conditions, we have sought and intend to seek rate increases whenever we can make out a good case and we don't intend to wait until the horse has been stolen. We expect first increases to come in industrial rates. Many were set competitively originally. And costs of competing sources of energy have risen. I think it is management's job to time rate increases so that the least effect is felt upon equity earnings.

There are bright aspects to our huge construction program. Nearly all our (General Public Utilities') additions to generating plant will replace less efficient facilities and replace purchased power. Savings in operating costs will follow. Our experience with five new generating units which have been in operation from one month to just over three years are interesting. They show savings per kwhr in the new plants ranging from 1.33 to more than 7 mills. Our experience is shown herewith in tabular form. Capitalization is at 11%, (6% return, 2.5% depreciation, 2.5% taxes.)

You will note that these capitalized savings per kw exceed even today's construction costs by a wide margin, except under the most adverse cost conditions. So I urge you to look at each company's problem. You may discover some worth-while investment opportunities.

Of course, all this expansion must be paid for. Here is one way it can be done. The industry has resources to pay for about 8% of the estimated construction program. It can finance 35% of it from non-cash items in the income statement—depreciation, amortization and retained earnings. It should be able to raise about 35% of the funds through sale of bonds and 12% through the sale of preferred stock. The small balance, or 8%, will have to be provided by present or additional stockholders. If the construction program should, for some reason, be spread out over a longer period, the requirements for equity capital will be reduced.

Interest and dividend rates on the new bonds and preferreds will undoubtedly be higher and some of the preferreds will have sinking funds. I wonder if this increased money cost may not be a blessing in disguise. It seems to me that where the rate-of-return formula has been applied, the tendency has been to fix such rates of return at decreasing levels. I think this trend has been arrested. May it not also mean that higher over-all rates-of-return may now be expected?

Utility Stocks Offer Profit

I wonder if you analysts haven't given common stock investors comfort in their apathy. I wonder if this isn't the time for you to reappraise your attitudes. It will be difficult to raise this equity capital. Some regulatory agencies will have to revise their security ratio ideas. Some will have to revise their ideas of returns necessary to attract capital. But electric utilities have much to offer the desire for capital gains. We sell the largest mass commodity at the lowest cost. Our product is necessary to life. We haven't even reached the horizon of our usefulness in the American economy. The industry's experience during depression years is most encouraging. We have demonstrated our resourcefulness and ability to develop the industry. Our stable earning power is a matter of record.

* This is a condensation of a paper by A. F. Tegen, President, General Public Utilities Corp, before the annual meeting of the National Federation of Financial Analysts Societies, New York City, March 4, 1948.

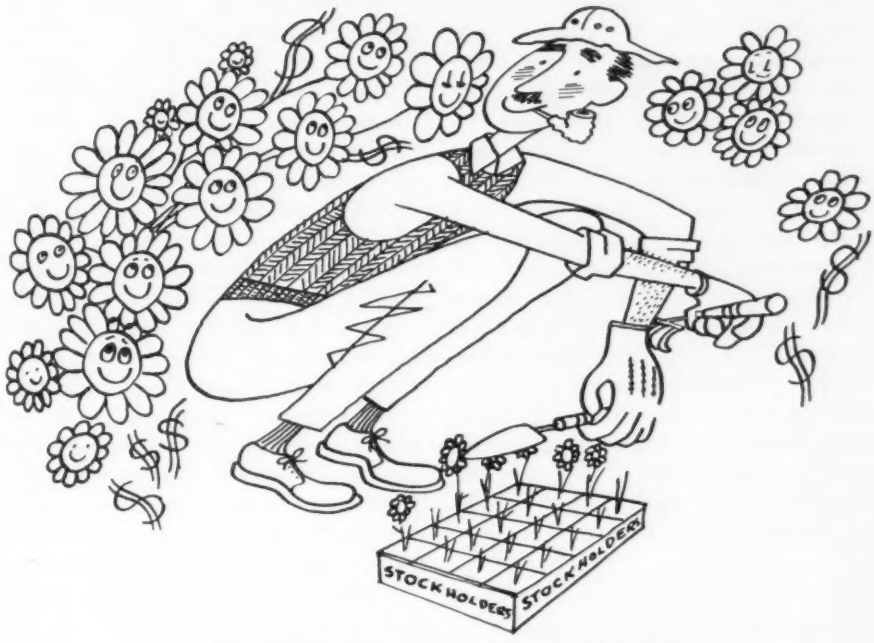
Capitalized Savings of Five Stations in Operation From One Month to Three Years

Station	KW Capability	Aver. Annual Saving in Cost of Power (net)	Capitalized Saving—at 11% (6% + 2½% + 2½%)	Capitalized Saving per KW
Arthur Kill—Staten Island	25,000	$605,800	$5,507,000	$220
Jennison—New York State	35,000	1,551,400	14,103,000	403
Front Street—Penelec	30,000	1,011,396	9,194,000	306
Williamsburg—Penelec	30,000	1,509,160	13,719,000	457
Middletown—Metropolitan Edison	50,500	1,800,000*	16,360,000	323

* Estimated monthly saving, first month (January 1948) = $216,000. Annual saving estimated at 12 × $150,000.

Acres Of Stockholders—All Happy

BEN-FLEMING SESSEL
Vice-president
Irving Trust Co, New York



EVEN PERENNIALS NEED CULTIVATION

NOT TOO MANY years ago, a gentleman made fame and fortune for himself by travelling the Chautauqua Circuit with a soul-searing address entitled, "Acres of Diamonds." He gave the message about seven thousand times. Invariably, it was as good the next time around. The theme, of course, was that seekers of riches need not scour the earth. Wealth untold lies in one's own backyard, ready for the taking by those with vision enough to see it.

It is a rare day, now, that some public utility official or trade journal does not frighten prospective investors by talking of the billions of new capital required by the industry. How to raise the needed funds is the subject of countless conferences. Will the institutional investor answer the prayers? If recourse to the public markets must be had, will the small investor be attracted by the statistics? Much talk is being heard of ways to find new friends. Perhaps it is not amiss to suggest that more attention might be paid to keeping old friends —present security holders in the industry—happy and satisfied.

Steps To Be Taken

The utility industry is like all others. Some members of the club do a good job, some not so good. A few are blazing the trail made necessary by the breaking up of holding company systems. Some have yet to sense the task. These brief comments are intended only to point up a few of the steps which may be taken by enlightened managements to induce confidence and preserve the friendship of those who are already holders of stocks and bonds in this great industry.

First, consider your bondholders. Except for the relatively few institutional holders, who customarily ask for registered bonds, most holders of bonds are unknown to the company whose debt they hold, complete strangers. Maybe that is as it should be. Still, an argument can be made that with other bonds to be sold, the best customers may be waiting in the backyard. Each company will wish to consider whether it is desirable, periodically, to reach as many bondholders as possible with word of the company's progress. The paying agent will, if requested, ask presentors of coupons to give their names and addresses. Many will, plenty will not. But if any substantial part of an issue is held by the general public, a good start to a list of holders can be made that way. A company desiring to use this procedure should consult with counsel as to the full implications of the Trust Indenture Act. A few corporate heads have felt it wisest not to risk forced dissemination of information, once a mailing list is created. Underwriters who sold securities often can be helpful in supplying names of holders. Security manuals and reports of investment companies are other sources of names. A few companies find it worthwhile to advertise to bondholders that an annual report will be sent on request.

Once the names of bondholders are known, what should be done with them? Certainly, much more attention should be paid toward cultivating continued interest by the institutional investor and the larger private investors than is practiced by most utility companies. Every opportunity should be seized to reach the eyes and ears of the this type of investor. Yes, "ears", because occasional calls might well be paid on a selected list of large investors. They should be made by a top officer who "knows the answers." Sincere invitations to visit the company's property and study the surrounding territory should be issued. When word of a new, large holder of bonds reaches the company the very least called for is a carefully prepared letter. It should offer every facility for information about the company and the promise of regular printed reports. Smaller bondholders should be treated with courtesy and respect, too. They should certainly, as a minimum, get virtually all information sent to stockholders.

It may be argued by some that the bondholder is like any other creditor and that his position should not be glorified by too much attention. Certainly that argument cannot be applied to the stockholder, for he is an owner—in the last analysis, the boss. More time is being spent these days on stockholder relations. But there

are still too many companies who treat the stockholder as a sort of necessary evil, someone from whom a proxy is needed once a year. No better advice could be given to any corporation than to suggest that stockholder relations be entrusted only to a mature, intelligent, thoroughly-informed official of real imagination. The last is not the least of the qualifications, for there are no set rules of the course. Too often a corporate secretary who specializes in "housework" is given the job of dealing with stockholders. Some large companies have designated a senior officer for this task—and that alone. Although the matter must be treated in a serious, professional fashion, it does not follow that outside public relations experts are essential. Their services might profitably be used on occasion, however.

Stockholder Lists

The man at the helm of stockholder relations must know who is on his crew, as far as he can ascertain, at all times. The stockholder list is his rollcall. He must study carefully each daily report of transfers, for he may learn much that way. He may, for instance, note changes and trends in geographical distribution of his company's stock which call for revisions in company policy. Suppose more and more holders of stock in the company's own territory appear on the stocklist. Or suppose the reverse situation—that ownership seems to be leaving the territory. There may be noted trends toward increased holdings by institutions, calling for increased attention to those larger holders. Certain bank or broker nominees may be disclosed as buyers or sellers, with whatever implication the fact may carry. Accumulations of stock may often be detected by the knowing analyst of transfer sheets. Since the stockholder is the boss, the company ought to know at least who he is and, as far as possible, what he stands for in his holding. Is he a real investor or is he an in-and-out speculator? How strong is he, by himself or in groups which may logically be imagined as capable of formation? These and a lot of other questions show the need for imagination.

Many corporations, including only a few utilities, follow the fashion of sending a "welcome letter" to each new stockholder. This epistle has to be well done or it falls mighty flat. In fact, it could be a real boomerang if its use were not subject to the most careful checks and restraints. Even without a few well-chosen words of welcome from the president, however, it would seem not to be amiss to send the newcomer to the family a copy of the last interim report and, possibly, the last annual report. A few corporations have found it worthwhile to have a senior officer call in person on each new holder of a substantial number of shares. In some cases this would be 500 shares, in others, perhaps more. The visits should be arranged on an informal basis, since ostentatiousness is to be avoided. While too much time must not be allowed to pass after the entrance of the new stockholder into the family, it may be better to wait two or three months in order to have the right officer call on the stockholder when he happens to be in his city. Thus far, relatively few corporations have tried a "farewell letter" sent to stockholders as their names go off the list. This letter is much harder to do well than the welcome letter. Also it is subject to greater risks, from the standpoint of bad stockholder relations, if badly done.

Not enough utility companies use to best advantage the opportunity presented by regular payment of dividends to develop a better stockholder relationship. For little more than a small printing bill, it is possible to pass to stockholders, quarterly in most cases, "dividend stuffers" which will keep the stockholder informed and interested about company progress. If interim reports are used in this connection, they should contain not only the latest quarterly figures; send also comparative figures for the year to date, and possibly, twelve months to date, together with those for the same period a year earlier. Stockholders might like to follow special advertising campaigns of a public utility.

One of the most important jobs of the man who heads a company's stockholder relations department is to make sure that his stockholder addresses are as up-to-date as he can keep them. This means the development, in cooperation with the transfer agent, of special procedures for checking changes of address. Various types of change of address forms are in use. They range from simple cards to more elaborate "eye catchers." All things considered, it is probably not extravagant to send a change of address form with each dividend check. Undelivered dividend checks should be followed up promptly and assiduously. The transfer agent probably has a well developed system which will be useful at this point. Endorsements on previous dividend checks, guarantees of signatures, and even special investigations by a bank in the city of last address are parts of the campaign to see that the stockholder gets the dividend to which he is entitled. A hundred stockholders thus pursued each year can make a hundred especially enduring friends.

Using Transfer Agents

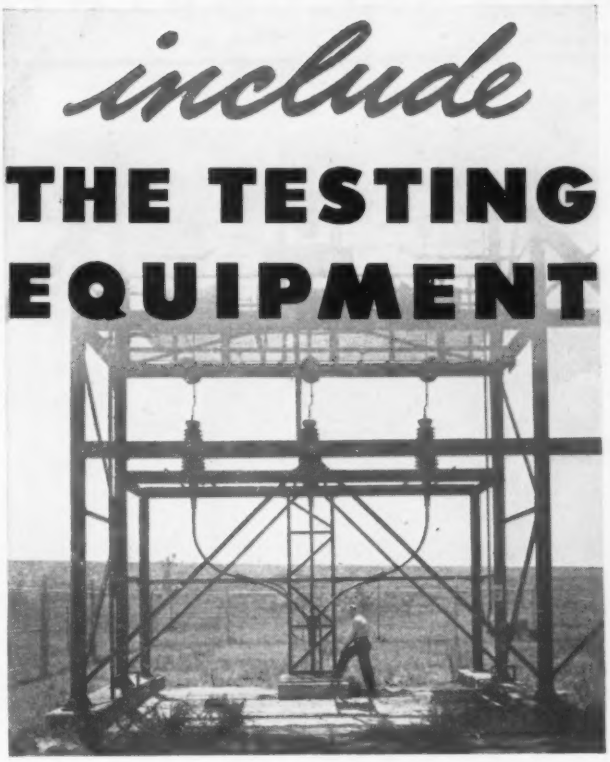
More could be done by way of using their full facilities. For instance, the transfer agent can be more helpful than is often the case at the time of annual meetings of stockholders. A large bank sometimes has ways of getting in proxies from nominees of other banks and from brokers. The transfer agent can, with the use of a special letter, ascertain from nominee holders well in advance of the regular mailing how many sets of proxy material will be required. It can take off the shoulders of the principal the problems of handling expenses incurred by nominees in the solicitation of proxies. Since increasing percentages of some companies' stock seem to be getting into the names of nominees, this function of the transfer agent should be pursued. In all cases, it would be well if corporate officials discuss their stockholder problems with the transfer agent.

Finally, a word of caution that may seem gratuitous. Each communication from a stockholder to the company should be treated with respect and consideration. It should be answered promptly, fully, and in the proper spirit. Nothing annoys a stockholder more than to get a perfunctory answer to something he regards as quite important or to get the apparent "brush off" of an obvious form letter. If the real position of the stockholder as a boss of the business can be kept in the minds of all company officials and employees who have anything to do with stockholders, a step will have been taken.

when you order cable

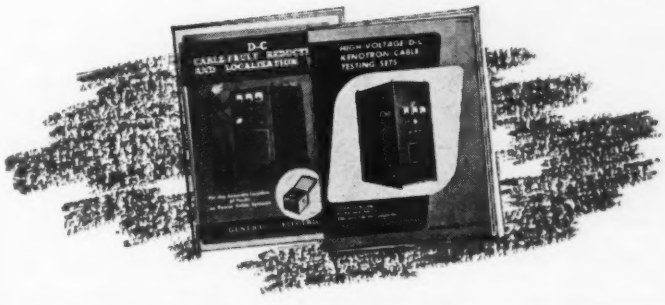
include

THE TESTING EQUIPMENT



Cable-testing equipment can be included in specifications for a complete cable installation—at a cost that is almost insignificant in the total outlay.

It will pay you to include this equipment. You will have it when you need it—beginning with the acceptance tests, and continuing through periodic testing.



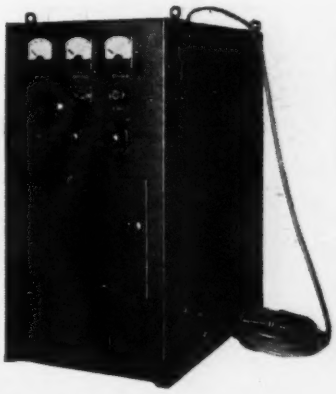
ASK FOR THESE BULLETINS. GEA-3687B gives full particulars on the Cable-fault Reduction and Localization Set. GEA-4595 gives information on the Kenotron set, and includes tables that will be of great value in planning and conducting installation acceptance tests. Both bulletins can be secured from the nearest G-E Apparatus Office, or from *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

these are the sets you will want

The Kenotron D-C Cable Testing Set

This set utilizes high-voltage direct potential to check condition of cable, and to warn of weaknesses before actual breakdown in service occurs.

Use of d-c for this testing offers these recognized advantages—initial price of equipment is less because lower capacity is required for testing; direct-potential testing, even at voltages approaching breakdown, causes no deterioration of cable insulation; more sensitive indications are possible; in case failure is established during testing, damage is held to the minimum because d-c testing limits the power that can be fed to the fault.



The D-C Fault Reduction and Localization Set

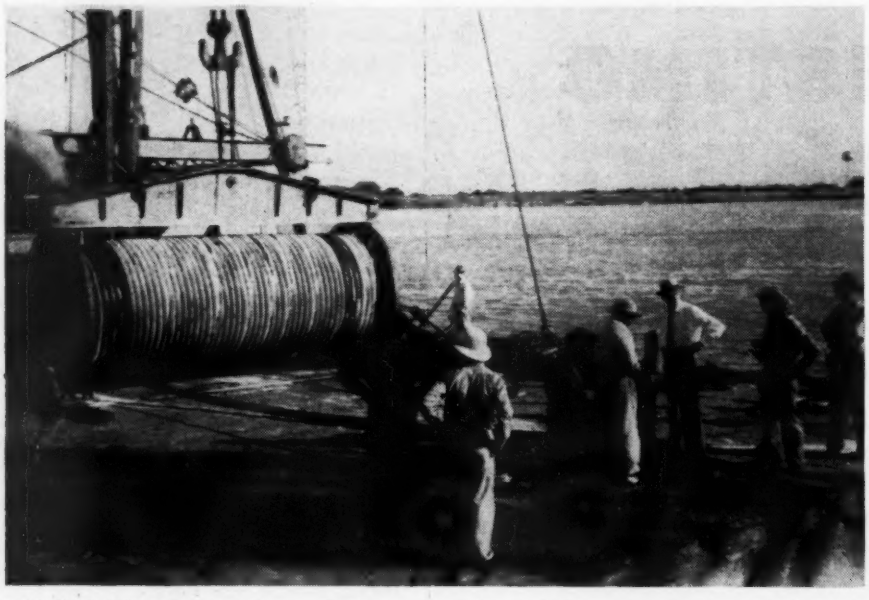
This set employs the "direct" method of fault location. A continuous, high d-c voltage is applied to the faulty conductor, and when the fault resistance has been reduced, an interrupted d-c tracing current is applied which permits location by an exploring coil and finally by test prods and a galvanometer.

The Fault Reduction and Localization Set is best used in conjunction with a Kenotron testing set. It is the fastest and most positive method of locating faults found in periodic testing—or after a service failure.

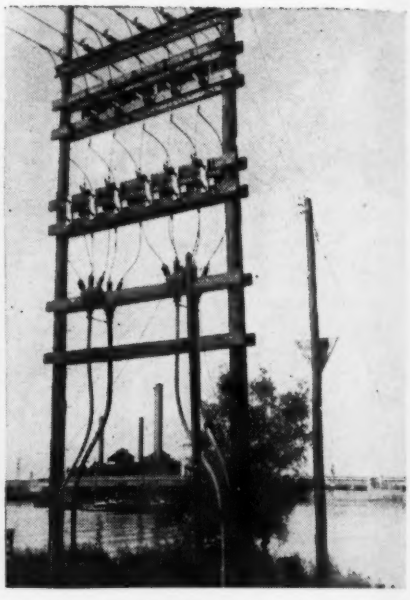
GENERAL ELECTRIC

401-52

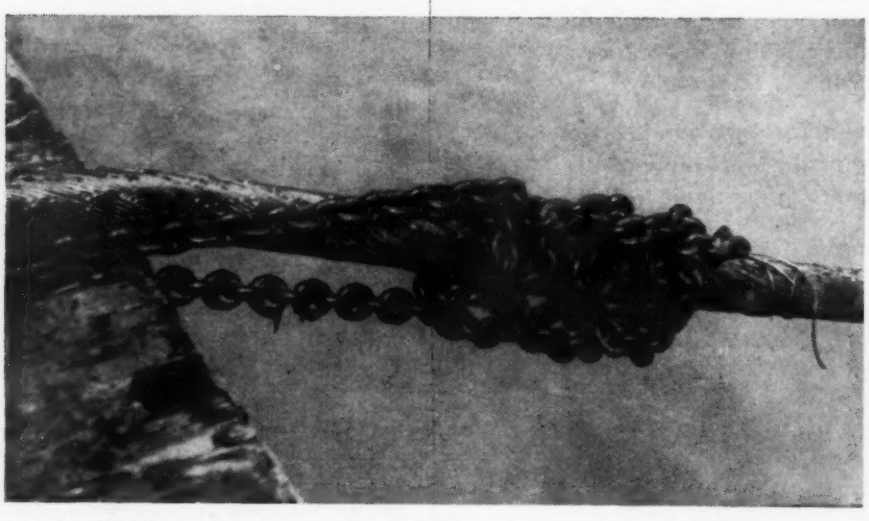
HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN



LAYING RUN has just begun. Brake bands on the reel that control tension failed shortly after this picture was made. Watchers in the foreground were busy for the rest of the trip



TERMINAL STRUCTURE on the west bank showing termination of four cables



CHAIN HITCH used in pulling and anchoring armored submarine cable. Made with ½ in. electro-welded chain, this hitch causes little damage to the cable

How New Orleans Lays Submarine Cable

CABLE-LAYING OPERATIONS in New Orleans present many problems not found at other locations due to unique conditions of current, river depth, deposit and removal of silt, changing channel and the constant dredging operations required.

Most of the territory served by the Louisiana Power & Light Co in this area is located on the west bank of the Mississippi River, across from New Orleans proper. Power is purchased from New Orleans Public Service, Inc and carried under the river at 13,800 v by 16 submarine cables spread over 10 miles.

On the New Orleans side, most of these cables terminate in manholes under wharves. Here they are spliced to underground cables leading to the Market Street plant of the New Orleans Public Service Inc.

Necessary Preparations

Preparations for laying one of these cables takes several days. For instance, a trench 45 ft below mean low water must be dug 200 to 300 ft from wharves on the New Orleans side. Considerable calculation and preparation is necessary to insure alignment in this trench.

The 350,000 cir mil 3-conductor cable commonly used, is received in continuous lengths of 3,000 ft on steel drums. These are transferred from ship or flat car to the deck of the cable-laying derrick-barge with a 100-ton marine derrick and placed in a cradle that has been lashed in place. While the actual laying operations may take only 8 to 10 min, the time from loading this cable reel on the barge to final transfer back to the carrier takes as much as 4 to 8 hr.

Procedure usually follows this pattern. First the cable is made fast

GENERAL ELECTRIC REPORTS ON NEW 1467 PYRANOL* THAT SIMPLIFIES HANDLING

All General Electric Pyranol filled transformers are now supplied with an improved Pyranol, designated as No. 1467.

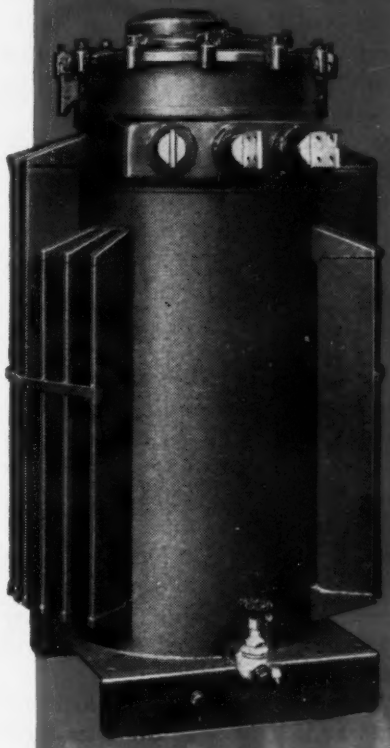
Pyranol is an insulating liquid, introduced by General Electric in 1932, which permits, under the National Electrical Code, the indoor installation of liquid-filled transformers without fireproof vaults. It is chemically stable and possesses all the necessary operating characteristics of a good insulating liquid, but unlike mineral oil, it will not form explosive or flammable gases, *and will not burn, oxidize, or sludge.*

The chemical composition of the original Pyranol has been improved so that, now, equipment insulated and cooled with the new liquid can be handled in the same way, in case of failure, as would oil-filled equipment. The principal difference, compared to the older No. 1488 Pyranol, is that the new No. 1467 neutralizes the hydrogen-chloride gas remaining in the liquid after an internal arc. This avoids any possibility of the formation of hydrochloric acid within the transformer.

This same improved Pyranol is also standard for Pyranol voltage regulators, and Pyranol filled interrupters and dead-break switches. Therefore, only one grade need be stocked for all Pyranol filled distribution equipment.

No. 1467 Pyranol is listed by the Underwriters Laboratories, Inc. It can be used in any proportions to replenish 1488-filled apparatus, although to obtain characteristics of complete neutralization, 100 per cent of No. 1467 must be used. For pricing information, consult our nearest Apparatus Office or write *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

* *Reg. U.S. Pat. Off.*



"YOU CAN'T BURN PYRANOL"

GENERAL ELECTRIC

under the wharf on the New Orleans side and is moved toward the end of the river. When it has reached the end of the 200-300-ft trench, brakes on the cable drum are applied, putting enough tension on the cable to raise it and permit alignment with the trench before the cable is dropped in. With this done, the barge runs in a line across the river to the marker on the opposite shore. During this run, corrections are made to insure that the cable rests in a straight line.

At the completion of the laying run, the barge is held against the shore by a tug while two large snatch blocks are placed about four feet apart over the bight of the cable. The cable is then pulled out by a winch truck on shore, causing the cable to run to the desired anchorage point. Here the cable is anchored and cut to length. It is next carried up a terminal structure where proper pot-head and lightning arresters are installed.

At the point where most of these cables are installed, the Mississippi River is about 2,400 ft wide and 100 to 150 ft deep. Currents encountered vary from 3 to 8 mph.

• • •

Lineman's Report Form Guides Trouble Analysis

MATCH BOOK COVERS, scraps of paper and the backs of work order forms have traditionally been linemen's repository for notes on line trouble. Something less than perfection of detail has marked the resulting reports. Recognizing this, New Jersey Power and Light Co, Dover, has corrected the situation on its system with the field report form shown at the right.

Complete Record

A stock of these forms are kept on hand, at all times, in line trucks and trouble cars. Linemen shooting trouble use them to record in complete detail the nature of the trouble, its cause and the time required to make repairs. Where further work is required over and above temporary repair, this too is indicated in the proper space provided on the field report form.

Data from accumulated field reports finds its way to a master form which gives a summary of troubles on the distribution system by feeder numbers. This summary report is used in the operating department for a variety of purposes; for instance, it has been particularly useful for checking fuse coordination.

Increases Efficiency

Experience with the report, since its introduction, has vastly improved the efficiency of trouble reporting. The elimination of several cases of service outages has been traced to its use. In most instances, recognition of the recurring nature and cause of the trouble pointed directly to the necessary corrective measures. The improved efficiency resulting from the use of these reports reduces expenditures of time and money.

OD-132-NJ-12-47

NEW JERSEY POWER & LIGHT COMPANY

FIELD REPORT - LINE TROUBLE

LINE NO. 522 LOCATION Indian Lake, Denville, N.J. DATE 10/31/47

TIME REPAIRS STARTED 3: PM TIME SERVICE RESTORED 3:30 PM WEATHER Rain + wind

POLE NO. DE-70192 SWITCH NO. 52219 METER NO.

NATURE OF TROUBLE

NO. LINE FUSES BLOWN 2 SIZE 50 amp INDICATE PHASE(S) 2+3 POLE NO. DE-70192

NO. LINE FUSES REPL. 3 NO. WIRES DOWN TOGETHER OPEN one

CUTOUT BOXES DEFECTIVE SIZE POLE FAILURE SIZE KIND

ARRESTERS DEFECTIVE SIZE TRANSFORMER FAILURE

GROUND DEFECTIVE SERIAL NO. (OLD)

NO. TRANSF. FUSES BLOWN SIZE SERIAL NO. (NEW)

NO. TRANSF. FUSES REPL. SIZE SIZE (OLD) SIZE (NEW)

CAUSE OF TROUBLE

TREES SLACK WIRES WIRE CLEARANCE POLE FAILURE LIGHTNING

ICE ON WIRES LOAD SEC. SHORT CIRCUIT OTHER Broken Pins

caused primary tap to burn off on Pole - DE-70209

FURTHER WORK REQUIRED None

TROUBLE TICKET NO. 13514 SIGNED R. J. Stephens

TROUBLE REPORT FORM for linemen's use contributes to complete reporting of trouble causes and repair measures

X-Ray Gage For Material Thickness

W. N. LUNDAHL
Design Engineer
Westinghouse Electric Corp
Baltimore, Md.

THICKNESS OF SHEET metal in modern high speed rolling mills, and of glass plate and containers, can be measured by x-ray. For this purpose a device has been developed by Westinghouse. The gage functions according to the radiation absorbed by the material. Some characteristics of the unit are (1) no contact with the material being gaged; (2) instantaneous response to changes; and (3) ready access to areas never before gaged.

The gage consists of two x-ray sources or generators and one phototube pick-up device at the apex of a right angle. All are mounted as one assembly. Radiation from the lower source is directed up through the sheet being gaged so that the transmitted rays will strike the pick-up. X-rays from the upper source are directed horizontally through a standard sample of correct thickness so as to strike the same pick-up. The two sources emit radiation 180 deg out of phase so that their rays alternate in striking the pick-up. The pick-up compares the intensities of the two beams after a large part of their radiation has been absorbed in the standard sample or test sheet.

Since the sample and test sheet are the same material and the radiation from the two sources is maintained at constant intensity, the transmitted

CORONOL CABLES

recommended for 80 deg. C.

SUPER CORONOL SPECIFICATIONS VS. INDUSTRY REQUIREMENTS

PHYSICAL CHARACTERISTICS	IPCEA AND ASTM REQUIREMENTS	SUPER CORONOL
Original		
Tensile strength, lb/sq in.	450	500
Per cent elongation	250	400
Set in 2-in. test piece, in.	½	½
After 7 days in Geer oven		
Tensile strength, lb/sq in.	400	400
Per cent elongation	200 } 70 C	250 } 80 C
After oxygen bomb at 70 C		
Tensile strength, lb/sq in.	400	400
Per cent elongation	200 } 48 hrs	250 } 96 hrs
Cold bend	−10 C	−10 C
Ozone resistance, .03% concentration	3 hours	4 hours
ELECTRICAL CHARACTERISTICS		
Insulation resistance		
K value	5280	10000
Power factor, per cent	5	4
Dielectric constant	5	5
Copper operating temperature up to 8000 volts	75 C	80 C
Copper operating temperature above 8000 volts	70 C	80 C

Test Values Raised Above IPCEA and ASTM Requirements Every reel of new Super Coronol cable meets these more rigorous specifications. Each new value widens the useful range of rubber for high voltages. And each new value spells a longer cable life.

GENERAL ELECTRIC

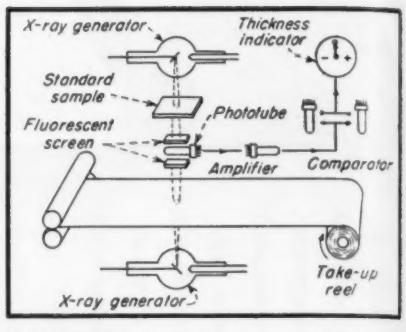
radiation depends only on the thickness of the material being gaged.

Any disparity in the intensities of the two rays hitting the pick-up is registered on the indicator instrument. At full deflection of the indicator needle, a red light on the instrument is energized and a throw-out or other mechanism is actuated through electronic circuits. A simplified schematic drawing of the gage is shown in the illustration.

The pick-up device is made up of a photomultiplier tube (a phototube with a built-in electron amplifier) surrounded by a fluorescent screen and enclosed in a light-proof cover. Absorption of x-rays by the fluorescent screen excites the compound of the screen to visible luminescence which is picked up by the photoelectric cell and converted into current pulses. The latter vary in amplitude according to the thickness of the material. The tremendous amplification of the photomultiplier permits the use of comparatively low-powered ray generators that are both safe and economical.

In this gage, the x-ray generators are enclosed in cast housings. The tube, its filament transformer, and the necessary high-tension transformer are immersed in oil and enclosed within the cast housing. Primary leads are brought out through a waterproof socket. The generator is a self-contained unit, and no high tension leads or cables are required. Since both x-ray generators are operated at only a fraction of their normal rating, natural air flow is sufficient for cooling.

One model of the gage has been designed for thicknesses of steel sheet from 0.005 to 0.050 in., but the basic equipment, with modification, is the same for other applications. This gage has a sensitivity of 1%. For example, if standard thickness is 0.050 in., a change plus or minus of 0.0005 would be indicated by full scale deflection on the indicating instrument, and 0.00005 would be readily discernible.



SIMPLIFIED schematic arrangement of components of x-ray thickness gage

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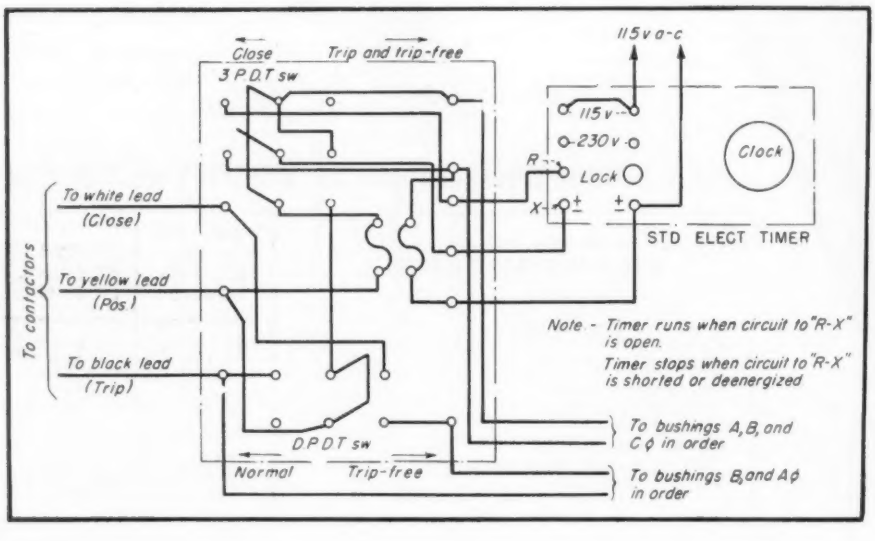
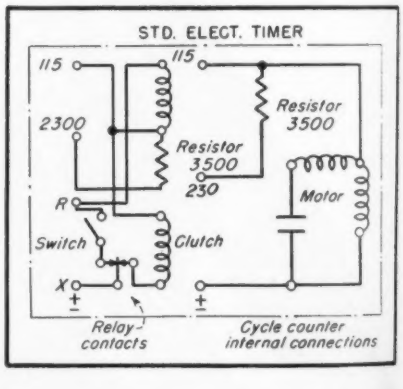
Test Box Checks Timing of Oil Circuit Breakers



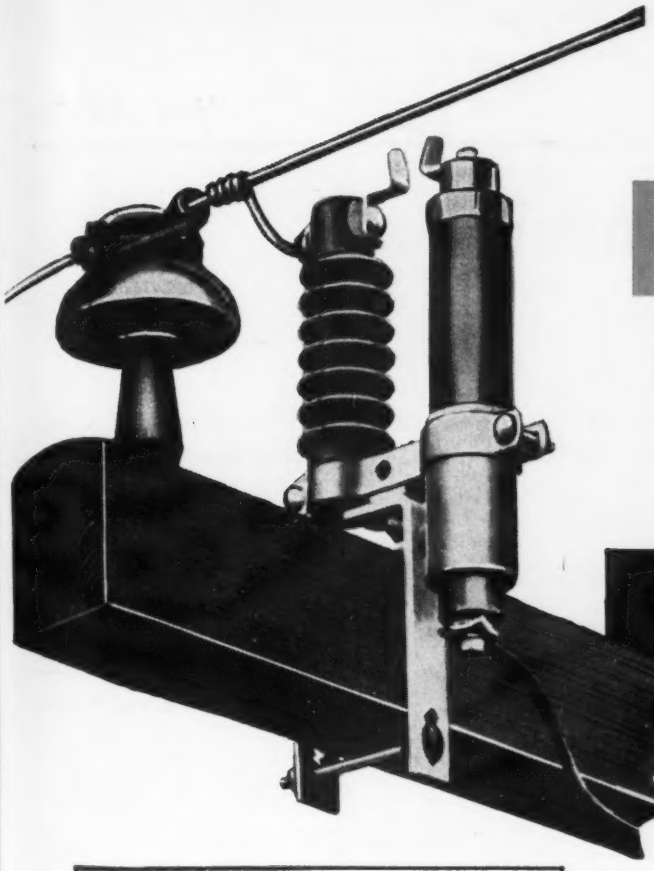


TEST BOX and electric timer for measuring closing, trip, and trip-free time of breaker. This self-contained unit houses the timer, switches, and all the test leads. For easy identification, these leads can be color coded

When an oil-circuit breaker has been installed at a new location; when a breaker has been inspected and is ready to be returned to service; or when control cables, control relays, closing or trip coils have been changed; the operating time of the breaker is to be verified. For these conditions, a test box is used by electrical maintenance personnel of West Penn Power Co, Pittsburgh, Pa. Test box connections are shown in the diagram. Use of color codes on the temporary leads to the contactor panel will make connecting the wires easier.

A test box for measurement of closing, trip, and trip-free time can be made of varnished plywood or similar material. It is a self-contained unit in which are located the timer, the switches, and all the test leads. For easy identification, these leads can be color coded. Likewise, the position of the switches for the various tests can be marked. The leads, timer, and switches are permanently connected within the test box to facilitate use by maintenance personnel.

To time a breaker, it is only necessary to open the box, make temporary connections to the breaker, and operate the switches and timer. On the lid of the box can be fastened the wiring diagram, instructions for making temporary connections and taking readings, and a table of closing and tripping time limits. The wiring diagram, directions, etc, can be covered with transparent plastic to keep out dirt, oil and grease that are normally encountered in the field.



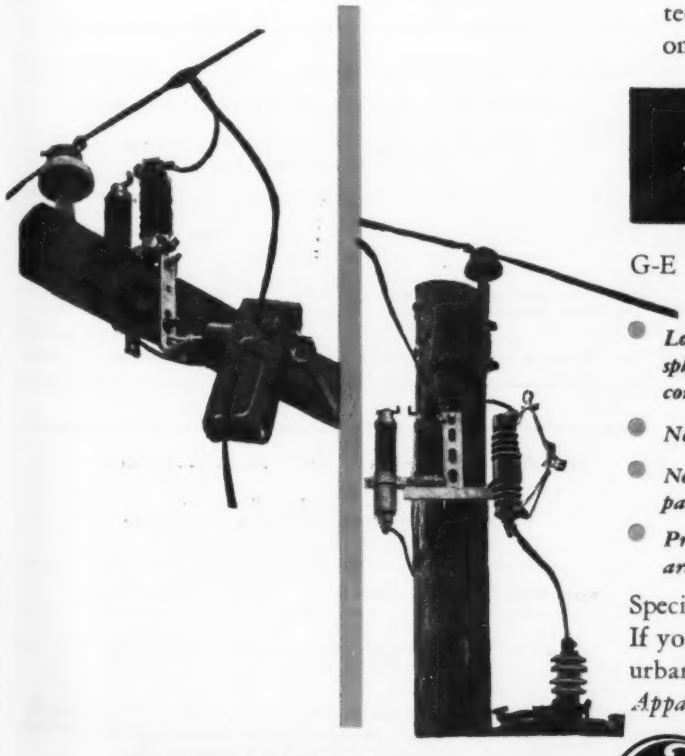
HI-STROKE RURAL ARRESTER

has performance efficiency heretofore unavailable in expulsion arresters

DESIGNED ESPECIALLY FOR RURAL SYSTEMS — 6-kv rating for 4800-volt circuits, 9-kv rating for 7200, 7200/12470 volt grd Y circuits.

ABOVE: 9-kv Hi-Stroke arrester, showing separate clamp-type mounting on crossarm.

BELOW: Hi-Stroke arrester can be mounted in combination with enclosed or open-type fuse cutouts, on crossarms or direct to pole.



The Hi-Stroke rural distribution arrester has exceptionally low impulse sparkover level, unsurpassed by any expulsion-type arrester—providing protection which closely approaches that of efficient valve-type arresters. AIEE and ASA standard impulse tests demonstrate the large margin of protection to either new or old transformers. Hi-Stroke arresters, both on Type HBA rural transformers and mounted separately, have already established a practically perfect operating record of protection and endurance to severe lightning-stroke currents on badly exposed rural lines.

. . . has EXCLUSIVE CONSTRUCTION FEATURES for longer life and utmost reliability.

G-E Hi-Stroke distribution arresters are the *only* expulsion-type arresters having *all* these features:

- ***Longer service life. Reserve supply of gas-evolving material {celofiber spheres} is automatically fed into arc-interrupting chamber to compensate for erosion during discharge.***
- ***Negligible arc flame during expulsion action.***
- ***No possibility of leakage current through arrester element because live parts are mounted on separate post insulator.***
- ***Prevention of line lockouts, because the line lead is supported separately from arrester element.***

Specify your Hi-Stroke rural arresters from Bulletin GEA-4582. If you prefer valve-type arresters, suitable for either rural or urban service, specify Pellet arresters from Bulletin GEA-2975. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

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Properties of Buna S Insulation For Wires and Cables

Data are for Buna S (GR-S) rubber compounds subjected to a single cure. The tabulations compare the grades commonly used for electrical insulation with natural rubber compounds

E. W. DAVIS
Chief Electrical Engineer, Simplex Wire & Cable Co, Cambridge, Mass.

TABLE I — Initial Physical Properties

ASTM Performance and Heat Resisting Grades

Grade	Number of Samples Tested	Percent Passing Tensile of			
		700 psi	800 psi	900 psi	1000 psi
Heat Resisting	272	100	96	80	43
Performance	161	100	96	90	81

Grade	Number of Samples Tested	Percent Passing Elongation from 2 in. to					
		7	8	9	10	11	12
Heat Resisting	272	100	94	90	85	84	77
Performance	161	100	100	99	92	89	67

TABLE II — Properties after Aging Tests

ASTM Performance and Heat Resisting Grades

Grade	Number of Samples Tested	96-hr O. B.* 70 C				8 Day O.B.* 80 C		20-hr Air Bomb	
		Percent passing not over 25% Depreciation		Percent passing not over 35% Depreciation		Percent passing not over 50% Depreciation		Percent passing not over 50% Depreciation	
		Tens.	Elong.	Tens.	Elong.	Tens.	Elong.	Tens.	Elong.
Heat Resisting	272	100	100	100	100	100	100	100	100
Performance	161	100	55	100	82	...	...	...	...

* Oxygen Bomb

TABLE III — Ozone Cutting Tests

Vertical U Samples, Bent 5 x OD
Stressed 100 volts per mil, 60 cycles

Minutes Rest	Sample No. 1 Minutes to Failure	Sample No. 2 Minutes to Failure
0.5	12	10
5.0	15	27
60.0	No failure; tests discontinues after 20 hr.	

Note: Ozone resistance is as good as for natural rubber but experience indicates that longer relaxation time is necessary after bending

TABLE IV — Electrical Properties of Buna S and Natural Rubber

Grade	Dielectric Strength Short time, 60 cycles, volts per mil		Dielectric Constant, 1000 cycles		Power Factor, 1000 cycles, Percent	
	Buna S	Natural Rubber	Buna S	Natural Rubber	Buna S	Natural Rubber
Code	360–400	375–425	4.50–6.00	4.50–6.00	4.0–7.7	5.0–7.0
Ozone Resisting	350–450	400–500	4.00–5.00	4.25–4.75	2.5–3.6	3.0–3.5
30% Performance	400–550	450–550	5.00–6.00	5.00–6.00	2.3–7.0	4.0–6.0
Heat Resistant	400–550	450–550	5.00–6.00	5.00–6.00	2.3–7.0	4.0–6.0
Low Water Absorption, low S. I. C.*	550–650	600–700	2.85–3.20	2.75–3.00	0.8–1.5	0.8–1.3
Lower Power Factor Types	.....	.....	2.85–3.20	2.75–3.00	0.8–1.5	0.8–1.3

*Specific Inductive Capacity

TABLE V — Mechanical Water Absorption

Milligrams per sq in. of surface after 7 days at 70 C in distilled water

Grade	Buna S	Natural Rubber
Code	30–45	35–40
30% Performance or Heat Resistant	25–40	25–35
Low Water Absorption (Coast Guard Type)	9–22	10–20

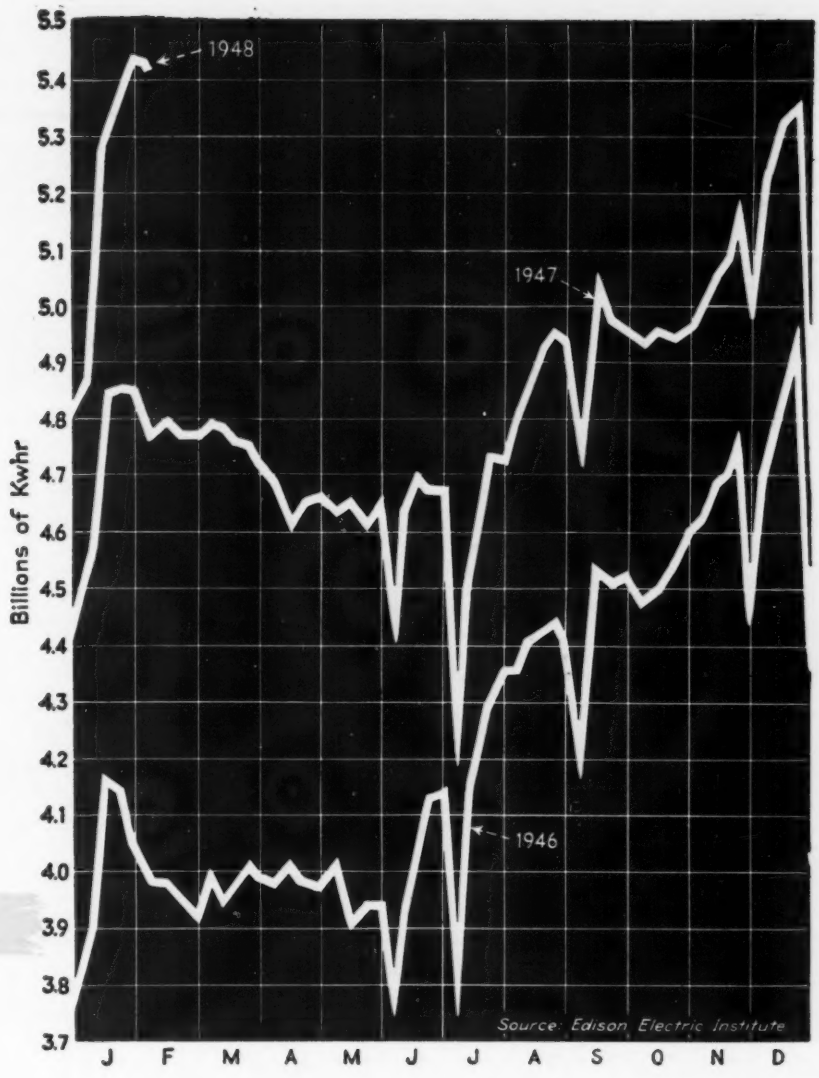
Note: Spread of values is due mostly to variations in the rubber—Buna S or natural

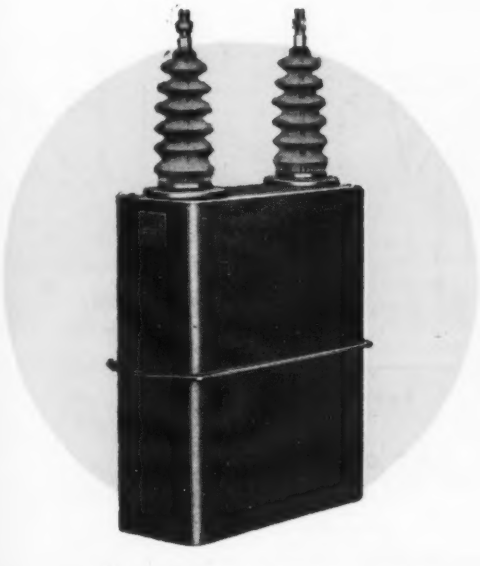
TABLE VI — Electrical Water Absorption

Coast Guard Type Compounds
Percent Increase in 1000 Cycle Capacitance in Water at 70 C

Days in Water	Buna S	Natural Rubber
1	0	0
8	2.6– 6.0	1.5– 5.0
29	6.5–12.0	3.5–12.0

Note: Both types of compounds had about 15 to 20 mg mechanical water absorption. Spread of values is due to sample of various conductor sizes and insulation thickness





G-E Pyranol® capacitors, including the 25-kvar pole-mounted unit, can be shipped almost immediately — many items from stock. They can be in service, helping you meet demands, in a matter of weeks. They are one of the most reliable pieces of equipment you can install. Capacitor kilovars are the lowest-cost means of gaining kw capacity on existing systems. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

FOR QUICK HELP IN MEETING YOUR

Growing load

Capacitors can help you deliver more kilowatts — quickly, and at low cost — now — when you need them. *Even if the power factor of your system is as high as 95 per cent,* you should check into the possibilities of increasing kilowatt capacity of generators, transmission lines and transformers — of cutting losses — and of reducing voltage drop — by immediate installation of capacitors.

GENERAL ELECTRIC

407-128A

Oil Circuit Recloser Mountings and Connections

Porcelain-housed and steel tank-housed units for 7.2/12 kv, also 2.4/4 kv, single phase and 3-phase urban and rural installations; an adaptation from standards of Tennessess Valley Power Distributors Association, Chattanooga, Tenn.

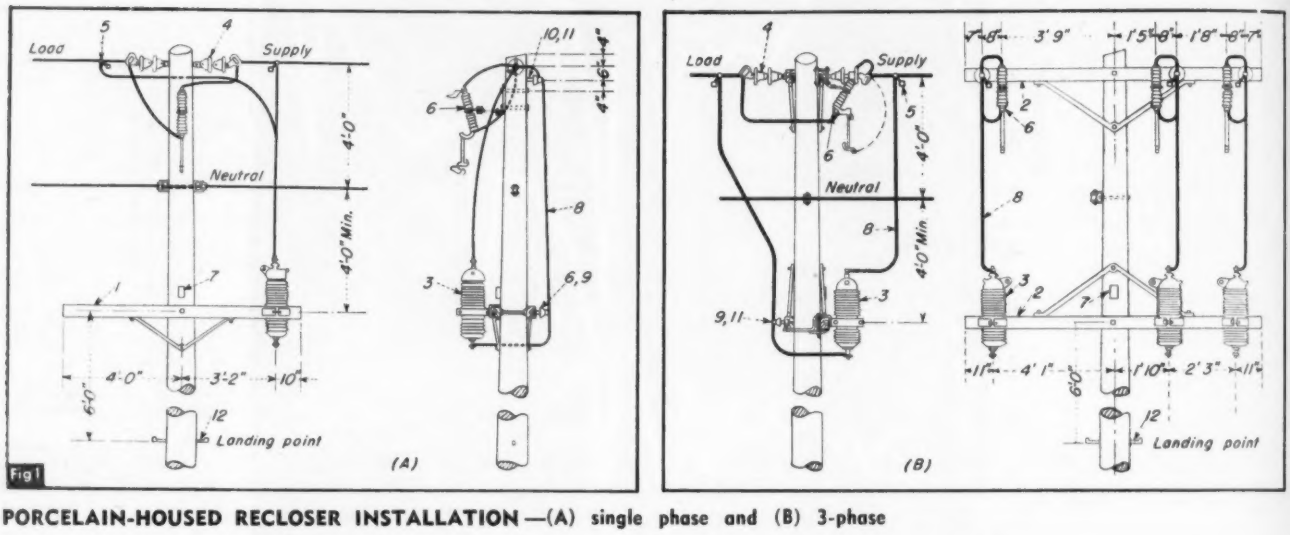


Fig 1

PORCELAIN-HOUSED RECLOSER INSTALLATION—(A) single phase and (B) 3-phase

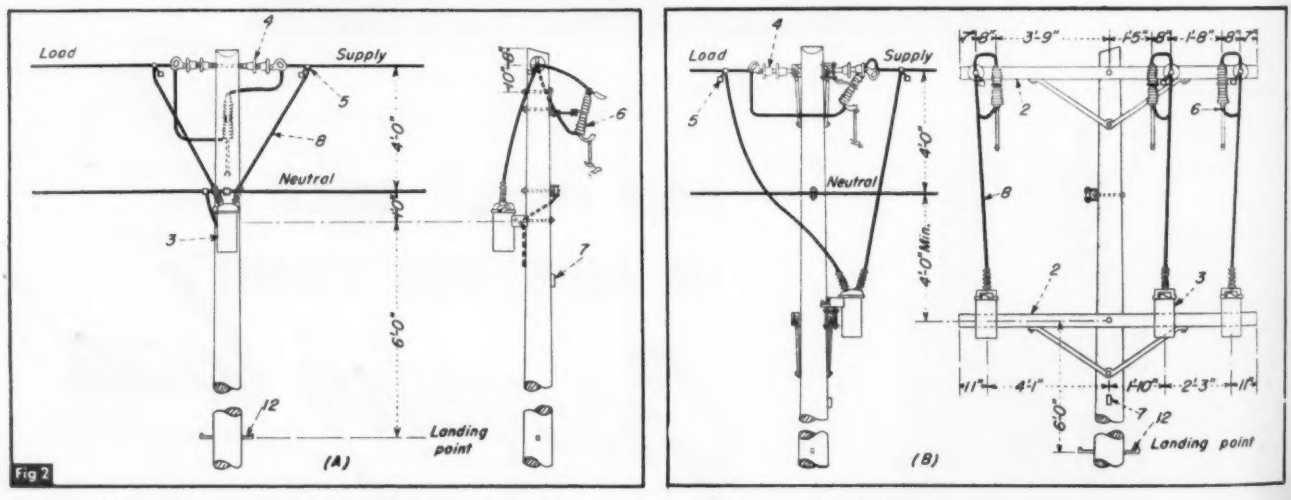


Fig 2

STEEL TANK-HOUSED RECLOSER INSTALLATIONS—(A) single phase and (B) 3-phase

NOTES

1. Fig 1A and 2A are for 7.2 kv installations; 2.4 kv is to be the same except for insulators and dead ends.

2. Fig 1B and 2B are for 12 kv installations; 4 kv is to be the same except for insulators and dead ends.

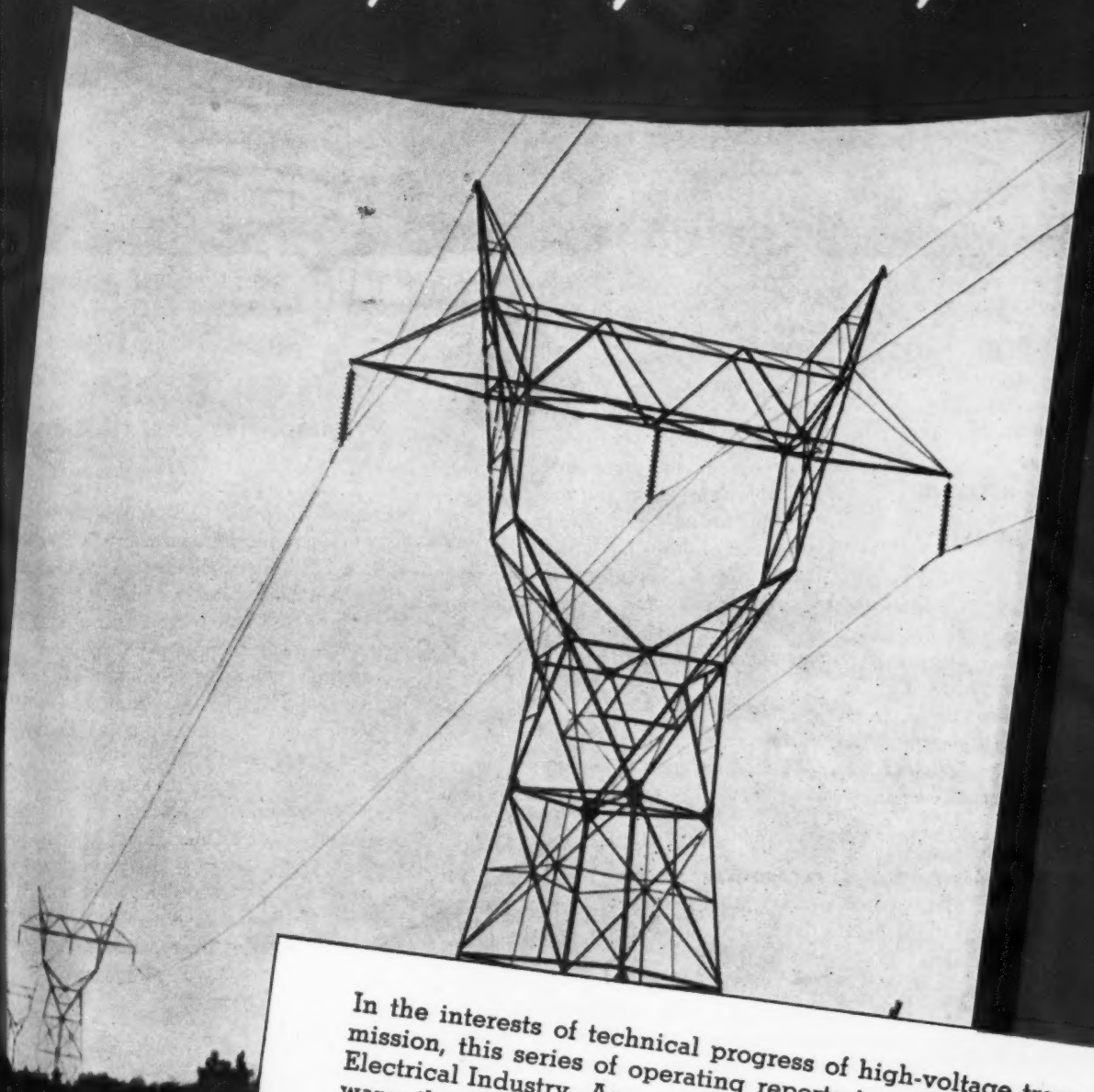
3. By-pass fuse size to be double the rating of the O.C. Recloser.

4. In Fig 1A and 2A, use back half of crossarm clamp for cutout extension.

LIST OF MAJOR MATERIALS

Item	Description	Quantities for Fig 1A	1B	2A	2B
1	Double arm, 3 3/4 in. x 4 3/4 in. x 8 ft	1	—	—	—
2	Double arm, 3 3/4 in. x 4 3/4 in. x 10 ft	—	2	—	2
3	Oil circuit recloser	1	3	1	3
4	Deadend assemblies	2	6	2	6
5	Hot-line clamps	2	6	2	6
6	Cutout and bracket	1	3	1	3
7	Spare fuse container	1	1	1	1
8	Lot lumpers and connectors	1	1	1	1
9	False pin, crossarm	1	3	—	—
10	False pin, screw point	1	—	—	—
11	Pin insulators	2	3	—	—
12	Lot pole steps	1	1	1	1

operates 75-mile, 220-KV line without lightning interruption



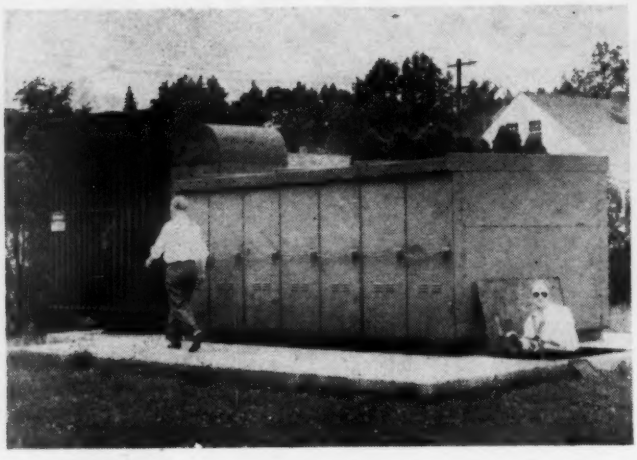
In the interests of technical progress of high-voltage transmission, this series of operating reports is presented to the Electrical Industry. As a manufacturer of insulators and hardware, the Ohio Brass Company is vitally concerned in this development. These reports and many others will soon be compiled in book form and made available to power company engineers.

Ohio Brass

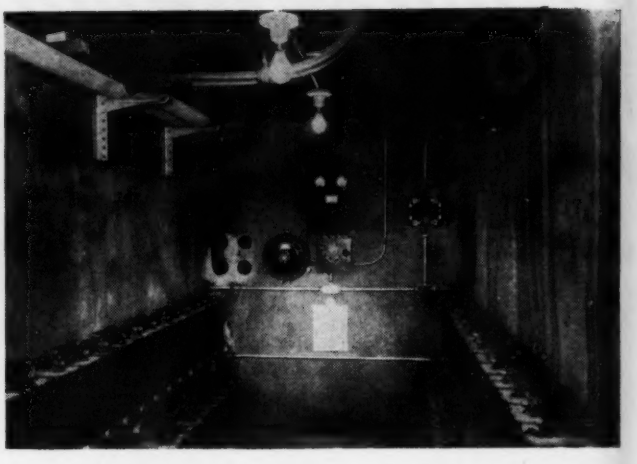
MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Underground Vaults House Storage Batteries



ENTRANCE TO BATTERY vault under unit substation is through manhole at end of switchgear



BATTERY VAULT in foundation under switchgear section of unit substation keeps batteries at near constant temperatures

JAMES BOOTH
Electric Storage Battery Co
Philadelphia, Pa.

and

WYMAN A. HOLLAND
General Electric Co
Philadelphia Works

IN MOST MODERN electric stations, control power for the circuit breakers, signals, etc, comes from storage batteries. In outdoor switching stations and substations it sometimes is a problem to house the battery suitably. Frequently this is accomplished by the use of a small garage-like building, of brick or steel, located at some convenient corner of the switchyard.

The difficulty with such an arrangement is the wide range of temperatures the battery must withstand during the year; from more than 100 F in summer to as low as —30 F or lower in winter.

Temperature Factors

Most batteries have been designed to operate at average temperatures encountered in temperate climates. Deviations from this average affect the operation of the battery. Higher temperatures require an increased charge rate to maintain the cells; therefore, they increase wear. Lower temperatures reduce available capacity. When very low, the installation of larger batteries at higher cost is necessary.

Heat pump studies, presently much in the public mind, show that at a relatively short distance below the surface of the ground, temperature is fairly constant. This suggests the practicability of installing batteries in an underground vault with suitable ventilation and drainage.

One utility confronted with the problem of housing a 60-cell, 125-v battery for a unit substation, solved it by building a vault in the foundation under the switchgear portion of the master unit substation.

Concrete Foundation Pad

Entrance to this battery vault is obtained through a rectangular manhole located at the end of the switchgear.

Cost of the entire foundation pad and battery vault for this installation was approximately $2,600, at present day prices. With a concrete pad alone estimated at $1,200, the net cost of the vault was $1,400, which compares favorably with any other type of housing obtainable.

In this particular installation any extra cost was considered justified from the standpoint of convenience in handling present and future cables, storage of accessories and tools, and station appearance.

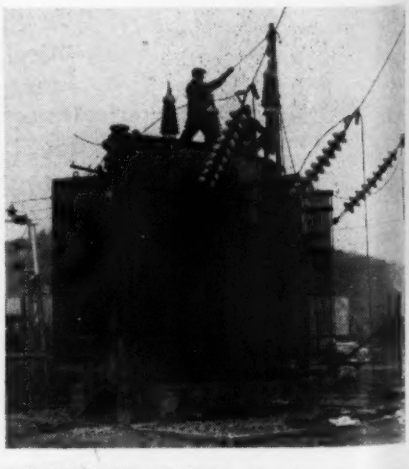
Successful Innovation

So far as is known, this is the first time a vault has been incorporated in the foundation pad of an outdoor switching unit for housing a battery. It has worked out extremely well and it is believed that other users of batteries in outdoor substations may find it worthy of consideration.

Transformer Design Simplifies Installation

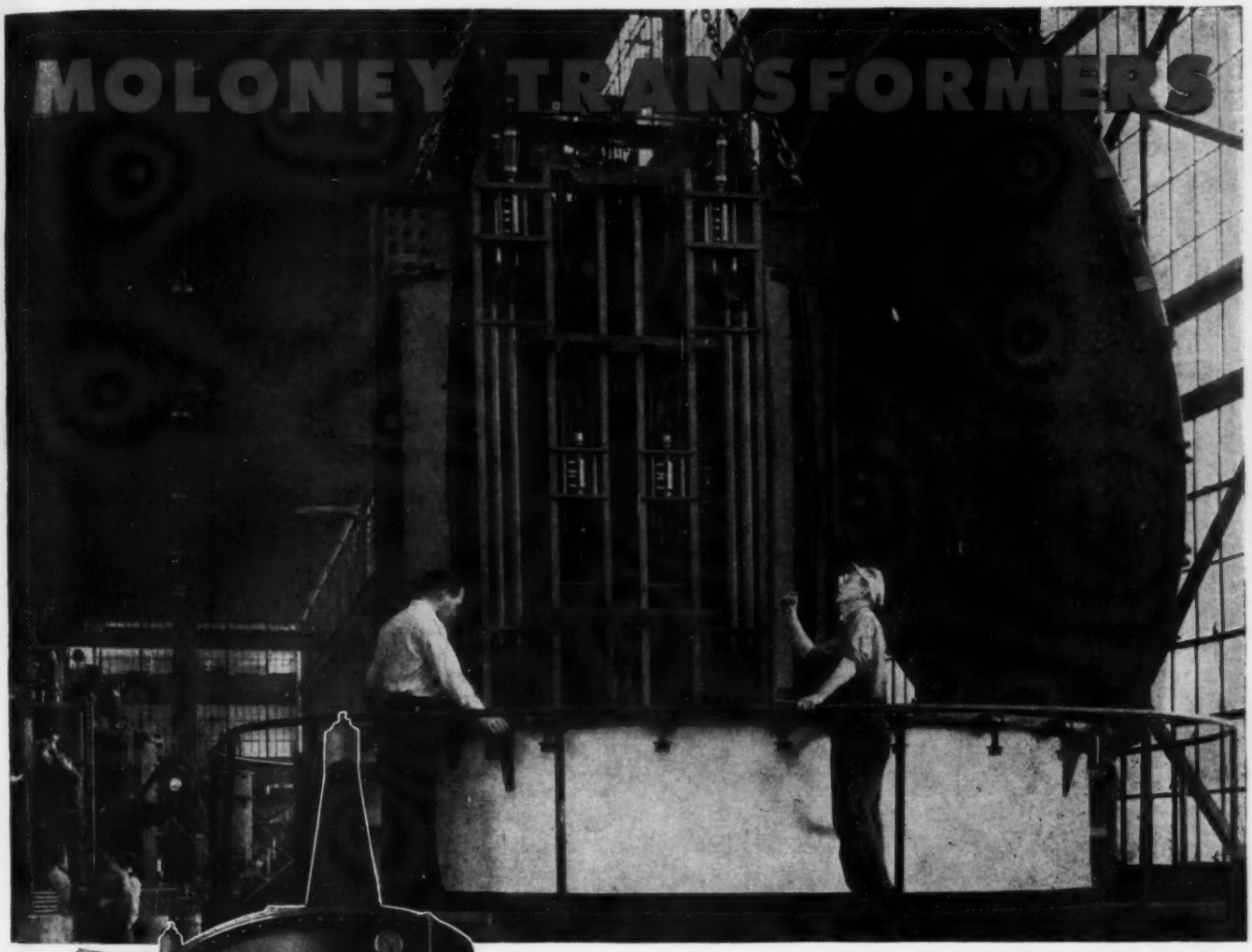
THE FOLLOWING DESIGN features were incorporated in a 66-kv transformer installed on an eastern utility system by Allis-Chalmers: (1) Leads were deadened directly on the case to eliminate extending substation structure; (2) height was reduced to simplify transportation; and (3) primary and secondary windings for series or parallel connections in either delta or star arrangement were included. This design greatly simplifies installation procedure.

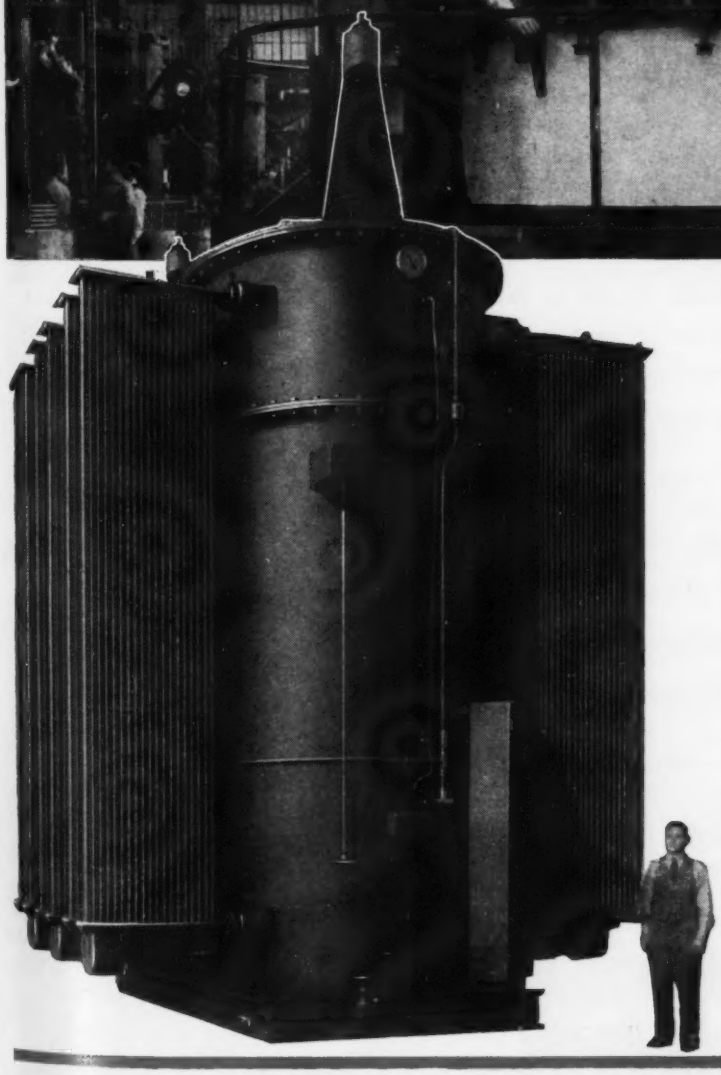
Welded brackets, designed to withstand 8,000 lb, support the incoming and outgoing leads. The unit extends 13 ft 10 in. above the base, and clears all trolley lines and under-



LEADS DEAD-ENDED directly on transformer case await connection as 66-kv bushings are installed

MOLONEY TRANSFORMERS





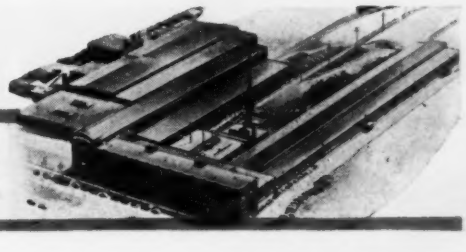
JUST ONE STEP . . . BUT *IMPORTANT*

VACUUM TREATMENT—Atmospheric moisture in insulating materials used in transformers reduces their dielectric and impulse strength. Amounts of moisture insufficient to cause breakdown on standard applied-potential and induced-potential tests may cause insulation failure under impulse conditions to which the transformer is normally subjected. Because Moloney recognizes the extreme importance of this step in production, core-and-coil units of all Moloney Transformers must be absolutely dry before they are placed in their tanks.

As illustrated above, units are placed in one of a battery of vacuum tanks. First, heat is applied by means of steam coils, evaporating some of the moisture. Then the air is removed from the tank and high vacuum maintained until test readings show the core-and-coil unit to be dry.

This is but one of the many important steps in the manufacture of Moloney Transformers. Operating records of these transformers are ample evidence of careful attention to all details of design, fabrication, and processing by an organization devoted entirely to the manufacture of but one product . . . transformers.

At left is a 28,000 KVA, single-phase power transformer, 161,000 volts primary, 13,200 volts secondary.



MOLONEY ELECTRIC CO. ☆ ST. LOUIS 20, MO.

POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896

A chain is only as strong as its weakest link. Prevent weak links in your product by using ILLINOIS bushings produced to meet your engineers' most exacting specifications.

ILLINOIS' thorough control of production methods results in the manufacture of porcelain bushings of high dielectric and great mechanical strength, with the utmost in dimensional accuracy. Careful kiln drying and firing, at constant temperatures, prevent internal stress.

These bushings can be standard glaze or radio interference-proof glaze. Dry type bushings are produced for all voltages up to 34.5 kv. Gasket seats are smooth and ground when required.

★

Complete Uniformity
Exact Dimensions
High Dielectric Strength
High Mechanical Strength

★

Specify Illinois Porcelain
for Dependability and Economy

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB • ILLINOIS

passes in the company's area. Secondary voltages available are 7,000 x 14,000 delta/12,110 x 24,220 star.

The transformer can be transported anywhere on the system where added capacity is needed. It can be used in substations which do or do not have the necessary cable supporting structures.

•

Industrial Transformers Need Thorough Check-ups

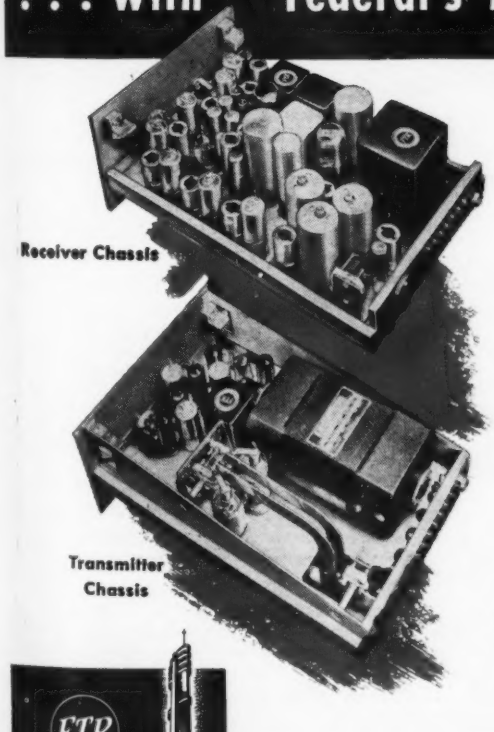
RECENT FAILURE of a 2,500-kva electric furnace transformer in a steel mill teaches a lesson of more complete inspection. The unit was 10 years old. Three years ago it had been extensively overhauled by the serving utility. Coils were cleaned and varnished, insulating oil filtered and replaced. The cooling facilities were cleaned and tested, but for some reason the iron cores were overlooked. These were not removed in the check-up and so it was not seen that the holding bolts had been elongated.

Following this incomplete check-up, the reactance coil burned out, and the core was severely burned. A short circuit was evidently caused by iron filings working into the windings from the core movement. The core-holding bolts loosened through stretching due to bumping of the unit. Had the cores been removed from the coils during the overhaul it would probably have been seen that these bolts had been elongated. It was recommended by the engineers investigating the trouble, which cost the industrial plant over $14,000 in repairs and delayed production, that a complete dismantling be given every three years, including removal of coils from cores.

•

Use of Cork Gasketing Material Standardized

AN EASTERN UTILITY stocks two grades and three thicknesses of resin-bonded compression cork in 24-in. x 36-in. sheets for gasket cutting (material by Armstrong). Spare gaskets and sheets are stored in coolest and most humid place available. The



Transmitter and receiver units can be removed and replaced in a few seconds.

FEDERAL'S MOBILE RADIOTELEPHONE units are especially designed to save time and money on inspection and maintenance. Both the transmitter chassis and the receiver chassis slide out like a desk drawer—can be completely removed and replaced in a matter of seconds.

All connections are made or broken automatically, by perfectly-aligned plug-in connectors on the rear of the chassis and the inside of the housing. This not only saves valuable time, but avoids the possibility of making incorrect connections when a unit is replaced.

This "instant interchangeability" is just *one* of the many outstanding features of Federal's mobile FM radiotelephone equipment. Every component is designed for the convenience and economy of the men who use it—and its dependability and performance are backed by Federal's 37 years of research and experience in building better communications equipment. Write Federal today for complete information. Dept. I 717.

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● FASTER fire-stopping power is your first requirement when fire breaks out... and Ansul Dry Chemical Fire Extinguishers give you that extra margin of protection against major fire damage.

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● For fires in flammable liquids and in electrical equipment, Ansul Dry Chemical Fire Extinguishers provide greater protection... pound for pound and dollar for dollar than any other extinguisher.

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ANSUL CHEMICAL COMPANY
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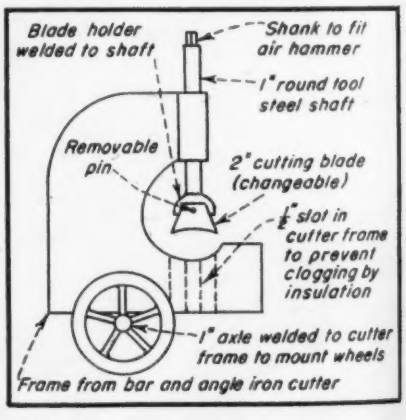
grades are No. 539, hard, $\frac{1}{8}$ in. and $\frac{1}{4}$ in. thick; and No. 523, medium-hard, $\frac{3}{8}$ in. thick. The 539 grades are used for gasketing machined or level surfaces, and the 523 for unmachined or rough surfaces and bushing adapter plates where the flange overhang may close down metal-to-metal before full compression is obtained with a thinner gasket.

In practice, all gaskets are compressed to one-half their original thickness. Proper compression cannot be obtained if the cork is dry and brittle. Any spare gaskets or stock found in this condition must be returned to the company's tool room to be humidified. All gaskets are given one coat of No. 1201 Glyptol and allowed to dry, followed by a second coat at the time of installation. Grease is used as a second coat rather than Glyptol on one side of gaskets for hand-hole covers or plates that are removed annually during inspection of the equipment. Cork gaskets used in rebuilding are required to be of the same thickness as those removed.

•

Pneumatic Cutter For Severing Junk Conductor

JOHN GIBSON
Jenkintown, Pa.


Blade holder welded to shaft
Shank to fit air hammer
1" round tool steel shaft
Removable pin
2" cutting blade (changeable)
1/4" slot in cutter frame to prevent clogging by insulation
1" axle welded to cutter frame to mount wheels
Frame from bar and angle iron cutter

HOME-MADE CUTTER operated by compressed air hammer makes short work of chopping wire and cable into junk lengths

SLOW PROGRESS in cutting 30 miles of trolley wire and 4/0 conductor into junk length with hand bolt-cutters was the inspiration for the pneumatic cutting tool shown. Two such cutters, each powered with a separate air hammer, cut twice as much wire in a day as six men with hand tools.

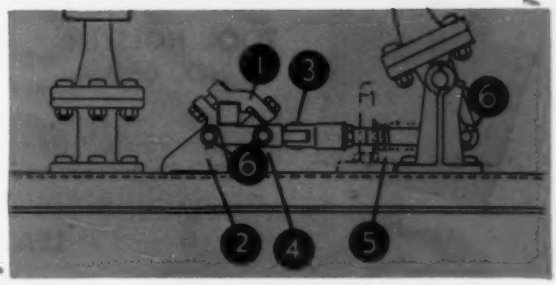
Use of the two cutters didn't stop

CHANCE TYPE WN-VN Switches*

TYPE-WN

. . . have INDEPENDENT ROCKERSHAFT

. . . and all these IMPORTANT FEATURES

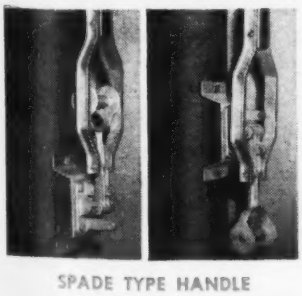


- **POSITIVELY NO SLAMMING . . .** Chance WN or VN switches cannot be slammed closed because a special toggle joint (4) arrests the downward movement of the contact blade. Overtravel reverses direction.
- **EXTRA OPERATING LEVERAGE . . .** The Rockershaft design gives extra leverage for smooth, easy operation. This, plus action of the toggle joint, gives ample power to break ice accumulations with only moderate effort. Bumper spring (5) cushions operating movement of tilting insulator, boosts closing motion.
- **UNIFORM CONTACTS—ALL PHASES . . .** The Rockershaft mechanism operates independently of the tilting insulator making positive contact on all phases. Mechanism is on dead center when blades are closed. Effect of distortion of control shaft is negligible, each blade in three pole switch making complete contact without affecting the other two blades. Blades and clips are silver plated, clips self aligning.

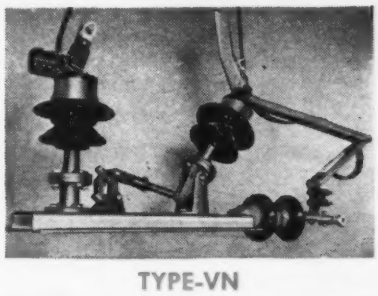
Plus

- **UNIVERSAL TERMINALS . . .** Terminal clamp cap may be reversed to accommodate smaller conductors. Range: No. 4 solid copper up to 600M C. M. cable or ½" and ¾" I. P. S. tubing.
- **SIMPLIFIED INSTALLATION AND ALIGNMENT . . .** Removable clamp (1) permits the operating shaft to be laid in position after switch units are mounted. No threading required. Rockershaft base (2) may be turned to aid alignment with operating shaft. This base and Universal joint (3) help compensate for cross arm warpage after installation.
- **NO OILING—SMOOTH PERFORMANCE . . .** All working joints fitted with Oilite bearings (6). Smooth operation, no field maintenance.

C481



SPADE TYPE HANDLE



TYPE-VN

* CHANCE SWITCHES (FORMERLY BOWIE) ARE BACKED BY 42 YEARS OF SWITCH ENGINEERING AND MANUFACTURING EXPERIENCE.

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BAGS... POUCHES... and BELTS

. . . provide the safe and handy way to carry all hand tools . . . whether you are running a line or doing inside wiring, panel or bench work. Many new and convenient units have been added to the Buckingham quality line . . . many which you can use and will want. Write for new illustrated folder!

BELT SUPPORT A new, more comfortable and practical belt support that permits greater freedom of arms and shoulders . . . safer . . . less likely to entangle with any work. Cat. No. 257.

LINEMAN'S TOOL POUCH

Rugged leather pouch, stoutly riveted and stitched. Carries rule, pliers and knife. Cat. No. 651

TOOL HOLSTER NO. 650

One large, two small, and two deep wing pockets for various tools. Knife snap optional on all Buckingham tool pouches and holsters.

LEATHER TOOL BAG NO. 303

Made of heavy, durable leather. Stoutly stitched and riveted to give years of service. Convenient for carrying emergency kit, repair tools, work clothes, etc. 15" long by 6½" wide x 7" deep.

ELECTRICIAN'S BELT NO. 85

Made of 1½"-wide durable leather. Fitted with nickel plated buckle, snap, tapeholder and tool loop. Accommodates Buckingham tool pouches and holsters.

RUBBER GLOVE BAG

8/0 vat-dyed olive drab duck. 16" x 8" x 4". Provided with belt snap. Keeps gloves dry and clean, and you can't lose them off your belt. No. 400

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BUCKINGHAM MANUFACTURING CO., INC.

Walter E. Craw, Pres. 5-7 Travis St., Binghamton, N. Y.

when the original job was finished. They come into play for cutting telephone and power cable and for many odd jobs around the store room.

Basic element of the first cutter was the frame from a conventional bar and angle iron cutter, available from any mill supply house. Cutting is done by a blade pin-fastened to a 1-in. round tool steel shaft, provided at its upper end with a shank to fit the chuck of an ordinary "jack" hammer. An axle and wheels were fastened to the frame so the device can be moved easily from place to place.

It was found desirable to cut a slot in the base of the cutter frame to keep insulation from clogging the cutter.

•

Superheater Uses Emergency Gaskets

Emergency use of regular sheet-packing asbestos for gaskets on superheater tubes has proved highly satisfactory for Alabama Power Co. Recently, gasket failures at a 10,000-kw, 200-lb secondary plant necessitated quick action. A temporary shutdown was necessary to clean the superheater tubes.

500 Gaskets Needed

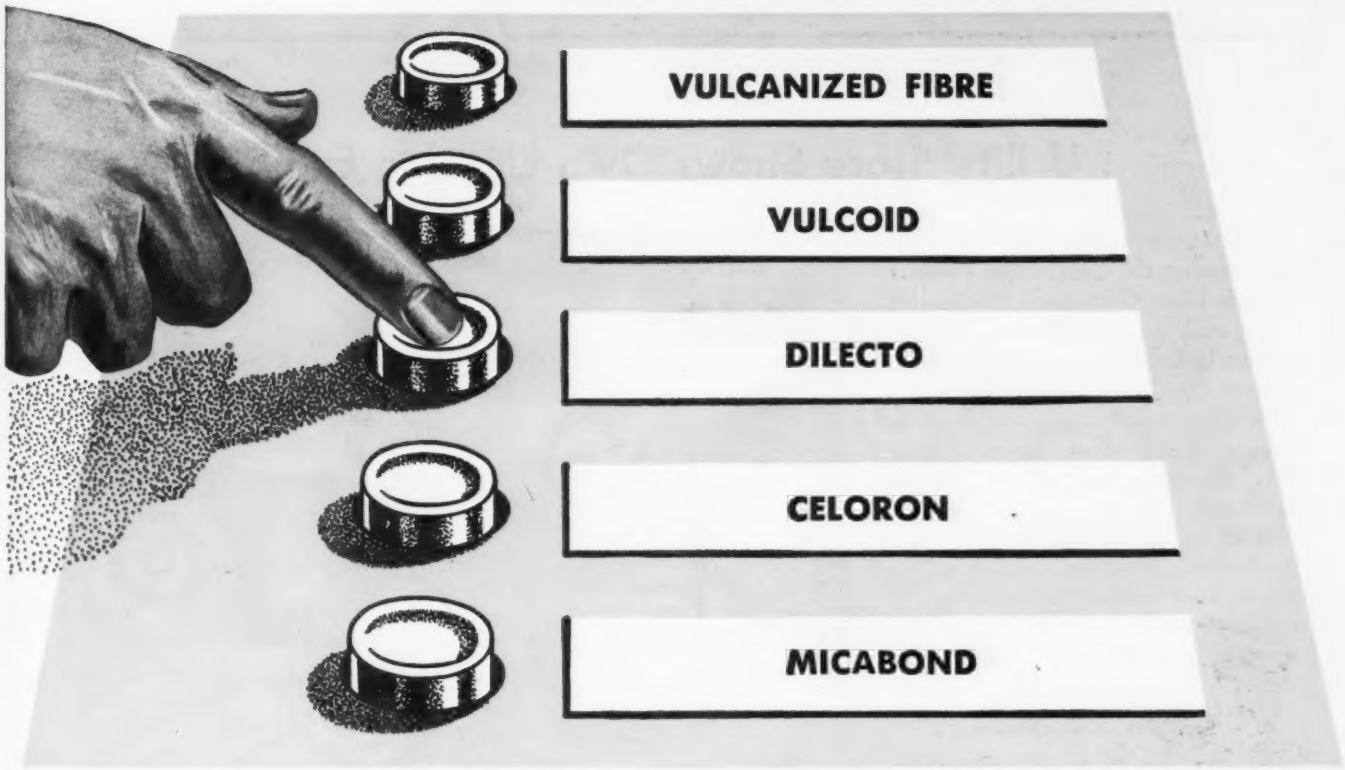
Regular copper-asbestos gaskets for the B & W round superheater caps were not in stock and none could be obtained in the local market. The earliest delivery was from two to three weeks, and 500 were needed to put the plant back into operation.

No Need For Replacement

From a supply of sheet packing asbestos the needed gaskets were cut with the proper ID and OD dimensions. They were installed and have given satisfactory results to the extent that when the regular gaskets arrived, none were replaced nor had to be replaced during two months' operation. Indications were at the time of inspection that the emergency gaskets, which had proved equally satisfactory as the regular supply, would not be replaced until failures, if any, developed.

Care was exercised that the plant was not overloaded. The plant had a total of six 600-hp boilers altogether and new gaskets had to be installed in all of them.

The right material for your job . . . right at your fingertips!



Electric Insulating Problems Are Easier to Solve When You Can Depend Upon UNBIASED Recommendations

Here's an engineering service you can really depend upon for unbiased recommendations of the right electrical insulating materials. That's because Continental-Diamond offers you a *complete* range of products with the physicals you want. C-D has no "axe to grind"—not one, two, or three materials from which to specify. Instead, you get the benefit of five different insulating materials that are subdivided into grades or combination of grades virtually "tailor-made" to meet your requirements. And C-D service goes further than that. To give you fast deliveries, large stocks are always kept on hand. Trained technicians are ready on a moment's notice to work with you—give you the information you want, quickly and accurately.

If you really want to save time and effort, and want to be certain of getting materials that fit the job, contact your nearest C-D office. For the *right* material, *right* at your fingertips, call or drop us a line, now.

DE-2-48

BRANCH OFFICES: NEW YORK 17 • CLEVELAND 14 • CHICAGO 11 • SPARTANBURG, S. C. • SALES OFFICES IN PRINCIPAL CITIES
WEST COAST REPRESENTATIVE: MARWOOD LTD., SAN FRANCISCO 3 • IN CANADA: DIAMOND STATE FIBRE CO., OF CANADA, LTD., TORONTO 8

Continental-Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK 15 DELAWARE

LOAD BUILDING

Utility Store Shows Own Lighting Exhibit

A DUAL OBJECTIVE was sought in illuminating the Cambridge (Mass.) Electric Light Company's new branch office and store in Brattle Square. Adequate lighting for office and appliance sales work was first in order. Next came a lighting layout forming a working exhibit of top-notch practice. Visitors operating small stores can hardly enter and leave the place without being impressed with its illumination. A corner location on the street floor offered opportunity to demonstrate the adaptability of fluorescent units to a non-rectangular area.

LIGHTING UNITS INSTALLED with axes at right angles demonstrate value of even distribution of lumens throughout small electric shop which is a branch office of the utility

Spotlights on Merchandise

Store length approximates 60 ft; width is 28 ft and height, 11 ft 6 in. Floor is gray and reddish tile, with brown asphalt diagonal stripes. Ceiling is light yellow. Walls have a gray dado three-fourths of the way up. There are 42 Smithcraft fixtures on the ceiling, each with two 40-w fluorescent tubes. For highlighting merchandise, there are also 16 Smithcraft 2-lamp, 150-w adjustable spotlights where the fixtures come together. In the windows are 23 Swivelier spotlights twelve of which are equipped with 150-w spots, and 11 with 150-w floods. Intensities in the store are 96 ft-c with spotlights on, and 52 with them off. Connected lighting load approximates 12 kw.

• • •

Blown Fuse Brings Wiring Information

"IT IS YOU, Frayed Cord, not me, Policeman Fuse, that is the nuisance around here"

J. H. VAN AERNAM
New York Power & Light Corp
Albany, N. Y.

EVERY CUSTOMER of the New York Power & Light Corp who calls to report lights out—usually fuse trouble—receives within a few days while the occurrence is freshly in mind, a mailing piece that tells why the fuse let go. Two causes are described. One is frayed cords and other damaged conductors in lamps, fixtures or appliances that cause short circuits; the other is inadequate wiring, gradually being overloaded by the addition of new appliances and lamps.

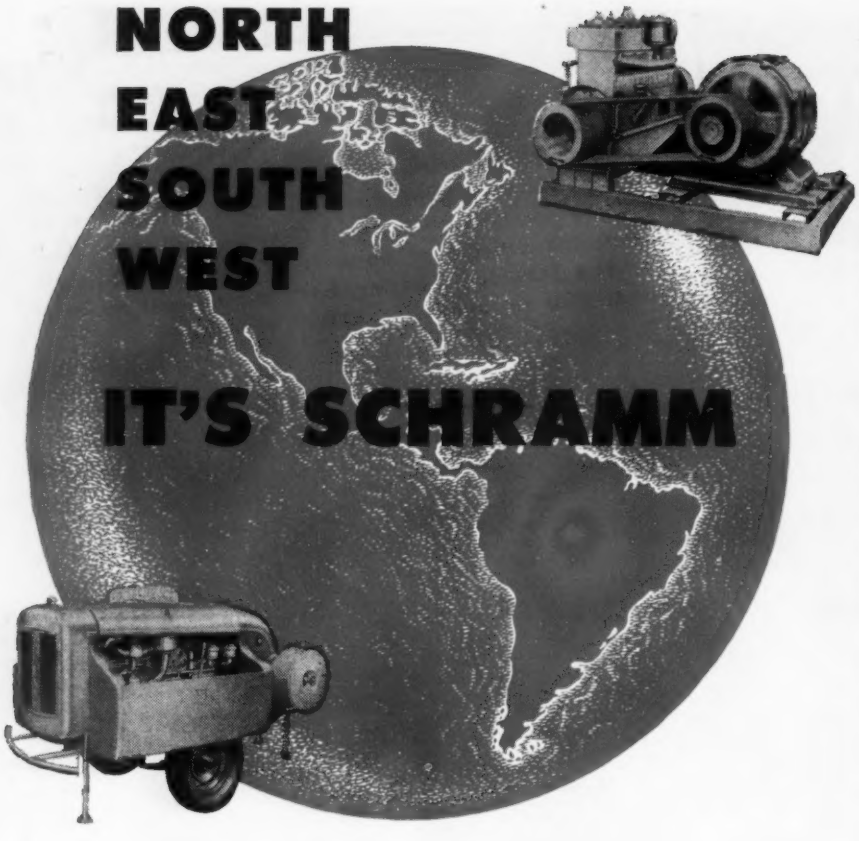
The text of the piece is chatty, likening the fuse to a traffic policeman and the wiring to roads. When the roadway is overloaded, making it dangerous, the policeman stops the traffic. Wiring adequate for present-day electric loads is compared with the modern multiple-lane, well-paved, highways designed for heavy traffic. The flavor of the piece is indicated by the following excerpt and the accompanying cartoon.

"Suppose we set up a traffic schedule for the wiring system, showing

MORE G-E LAMP ADVERTISING SUPPORT FOR THE NEW CERTIFIED LAMP PROGRAM

Here's another important General Electric sales message, recommending the new Certified Lamps to people everywhere. This full-page, full-color G-E Lamp advertisement appears in the Feb. 28 issue of The Saturday Evening Post, which will make it available to over 12,000,000 readers.

THE SATURDAY EVENING
POST
It's "High Fashion" Time in Lamps these days...
Not only
More Light...but
More Beautiful
Lighting with
Certified Lamps
Women seeking beauty—men looking for eye comfort—are finding in these new Certified Lamps the ideal combination of "good looking" and "good seeing" they have wanted for so long.
Why don't you see these latest achievements of 2½ years of lighting research and the creative genius of over 100 of the country's leading portable lamp manufacturers today? Look for Certified Lamps wherever portable lamps are sold. All sizes, all types—and best of all . . . all prices!
General Electric does not make portable lamps for home lighting. However, we are glad to recommend Certified Lamps as a great step forward . . . toward easier seeing, eye comfort and eye appeal.
THIS IS A Certified Lamp
LOOK FOR THIS TAG!
It identifies the new Certified Lamps which
. . . give scientific control of light quality
. . . give proper light distribution
. . . protect against glare
. . . provide plenty of good light for eye comfort
. . . every lamp is built to 105 exacting specifications and certified by Electrical Testing Laboratories, Inc.
Be sure your new Certified Lamp is equipped with G-E lamp bulbs
100-200-300 watt for use in the large floor lamp 55¢
30-100-150 watt for use in table lamps, bridge lamps, swing-arm lamps, and pin-up-wall lamps . . . 33¢
30-70-100 watt for use in dresser and dressing table lamps 27¢
G-E Circline Fluorescent lamp—32 watt—12 inch—used with filament bulbs in many large floor and table lamps to give more light . . . $1.75
When you buy bulbs for any purpose, always remember the constant aim of G-E lamp research to make all
G-E LAMP BULBS
Stay Brighter Longer!
GENERAL ELECTRIC



SO VERSATILE

. . . because Schramm can furnish air for any compressed air job in your work; and versatile because there is a size and model Schramm to fit your individual needs! Just specify the size you need.

SO EASY TO OPERATE

. . . merely by pushing a button to start, and compact and lightweight enabling you to move the portable units wherever you like! Meanwhile, the stationary units take up very little room, are vibrationless and no trouble!

SO ECONOMICAL

. . . because Schramm can do *all* your compressed air jobs quickly and efficiently. Features that assure economy include 100% water cooled, forced feed lubrication, and mechanical intake valve.

it pays to use Schramm!

Your field has found that Schramm Air Compressors well fit its needs. And has specified Schramm everywhere . . . North, East, South and West. Write today for full data.

TOOLS FOR THE JOB

Schramm Inc. also has a complete line of Pneumatic Tools to offer and recommend for operation by their Compressors.

These include Rock Drills, Paving Breakers, Trench Diggers, Clay Spades, Backfill Tampers, Tie Tampers, Sheeting Drivers, Demolition Tools, Chain and Circular Saws.

Write for bulletins and prices.

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

the maximum number of watts that the wires can safely carry, and the size of fuse to be selected to maintain that safety; in other words, how much traffic can safely flow over a roadway before a fuse policeman stops traffic.

Traffic Watts	Roadway Size of Wire*	Policeman Fuse
1,800	14	15
2,400	12	20
3,600	10	30
6,000	8	50
7,200	6	60

* The size of wire increases as the number decreases. No. 6 wire is much larger than No. 12 wire.

"The watts referred to are what light the lamps, preserve, prepare and cook your food, heat and cool your house, do the cleaning and the laundry, keep time, entertain the family, and help do a dozen other jobs."

•

Potentialities of Modern White-Way Lighting

A. F. DICKERSON
General Electric Co
Schenectady, N.Y.

HIGHER INTENSITY LIGHTING of business streets is a powerful lever for jacking up commercial lighting loads. It was so used in the past and can be again.

For example, in 1916 the Pacific Gas and Electric Co installed a "White Way" on Market Street in San Francisco. Only they called it the "Path of Gold." Anyway it was top notch for its time. Surveys of store and sign lighting on a typical thousand feet of Market Street were made before and after the new lights were turned on. In this distance, the sign load before was 8 kw and the show window load 80 kw. After the increase in street lighting, which was from 3 kw to 28 kw for the thousand feet, the sign load rose to 26 kw and the show window load to 200 kw. There's the leverage. A street lighting increase of 25 kw raised the sign and show window load 138 kw.

There are about 400,000 luminaires now on business streets of the nation. Not all, but many, of them date back perhaps not to 1916, but still too many years. At least 300,000 of them should be modernized and probably 100,000 or more should be added. Figuring the new ones at 500 watts each and assuming that moderniza-

While building costs go up and up . . .

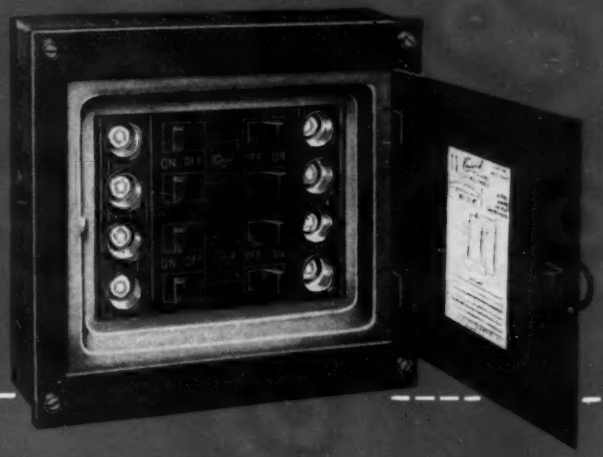
The cost of construction continues to soar . . . but Federal NOARK Panelboard (Type NTPS) still remains America's most economical, quality panelboard! That's why—on every job that requires perfect control protection of lighting and small power circuits—contractors achieve economy without sacrificing quality . . . by installing reliable Federal NOARK Type NTPS!

Triple Improved!

1. Sure contact spring incorporated into switch assembly of stationary parts.

2. Only three current-carrying parts in each circuit . . . each part heavier and more rugged than ever.

3. Phenolic panelboard unit . . . handsomely designed . . . durable.



FEDERAL NOARK PANELBOARDS (Type NTPS) ARE STILL PRICED AT A COMMON-SENSE LEVEL!

Federal NOARK

Executive Offices: 50 Paris Street, Newark 5, N. J.
Plants: Hartford, Conn., Newark, N. J., St. Louis, Mo., Long Island City, N. Y.
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Federal Electric Products Company, Manufacturers of a Complete Line of Electrical Products, including Motor Controls • Safety Switches • Service Equipment • Circuit Breakers • Panelboards • Switchboards • Bus Duct

Federal
NOARK
Panelboards

These are the BEST

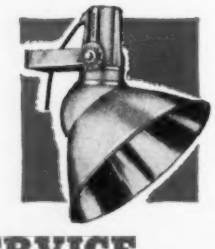
— without a doubt — the finest line of flood-lighting units ever to bear the famous SILV-A-KING label. And for a company which has enjoyed the reputation that has been SILV-A-KING'S for over a quarter-century — that's a lot.

ISLAND LIGHT

Life-time porcelain enamel Reflector. Cast aluminum support and top housing. Lamp mounted base up. All wiring encased.

SPORT AREA

Alzak aluminum floodlight. Calibrated for vertical and horizontal adjustments.

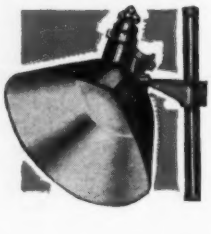


SUPER SERVICE

Life-time porcelain enamel floodlight. Calibrated for vertical and horizontal adjustments. Enclosed wiring bracket illustrated.

UNI-FLOOD

Life-time porcelain enamel floodlight. Swivel joints for complete adjustments. Open wiring bracket illustrated.



UTILITY

Floodlight of seamless, one-piece heavy-gauge aluminum. Swivel joints allow complete adjustment.

NEW CATALOG

For the complete line of SILV-A-KING Flood-lighting Units, and all other Incandescent Reflectors, send for free Catalog #50.

BRIGHT LIGHT REFLECTOR CO.
INCORPORATED
Subsidiary of BRIDGEPORT PRESSED STEEL CORPORATION
FAIRFIELD & STATE, BRIDGEPORT 5, CONN.

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Los Angeles, Cal.
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
San Francisco, Cal.
St. Louis, Mo.

SILV-A-KING
LIGHTING EQUIPMENT

tion will bring the old ones up from 300 to 500 w, means 110,000 kw in added street lighting load. That is not big in comparison with the utilities' total installed capacity of around 50,000,000 kw. But it is pretty big alongside the present national street lighting load—over 25% of it. And don't forget the leverage.

•

Would Overtime Lighting Fatten Pigs Faster?

W J. PARVIS
Rural Service Manager
Public Service Co of Indiana, Inc
Indianapolis, Indiana

PIGS, LIKE HENS, evidently benefit from a longer work day. Proof as yet has not been definitely established. However, there are strong indications that it is true.

This chance finding was made by some farm customers while doing experimental work. They had installed an automatic electric ice control unit on the feeding floor outside the hog barn, so that the pigs would not find it necessary to break through the ice with their snouts in order to get a drink. Incidently, this idea worked.

Working late one night while these tests were going on, one of the farmers inadvertently left the lights on in the hog barn. Much later that night he returned to turn them off. To his surprise he found the pigs up and at work, eating and drinking!

As a result he marked several shoats, left the lights on all night every night. Again, to his surprise, he found the shoats gained from one to as much as two pounds every 24 hours!

Now he is advocating night-lighting to induce longer feeding hours and quicker growth for pigs in the winter. In the meantime, the Rural Service Division of the company is requesting the Purdue agricultural experiment station to study these surprising developments.

This incident has caused us to do some speculating. If light will make it easy for a pig to become a bigger pig, faster than would otherwise be true, would this same fact not be true of a rooster, or a broiler? It may develop that this customer's chance discovery will have far reaching effects.

ALCOA Activated Alumina gives you *complete* Transformer Oil Maintenance

This block of ALCOA Activated Alumina, neutrally bonded*, and used in the Briggs Filtration System, removes: ACID . . . SLUDGE . . . MOISTURE!

Maintenance of the oil is *complete*, because it is *continuous*.

The Briggs Filtration units, employing ALCOA Activated Alumina, operate on the simple thermo-syphon system—*no moving parts*. They will:

1. Continuously reduce acids already existent, and inhibit further production of acid.
2. Continuously reduce sludge already existent, and arrest further production of sludge.
3. Continuously reduce the existing moisture content, and minimize the further entrance of moisture.
4. Maintain or improve dielectric strength.

For complete information on this effective method of *completely* maintaining your transformer oil, write to Briggs Filtration Company, Bethesda, Maryland, or to: Aluminum Company of America, Chemicals Division, 1783 Gulf Building, Pittsburgh 19, Pennsylvania.

**Patented, Briggs Filtration Company.*

ALCOA

ALCOA CHEMICALS

ALUMINAS AND FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE

CRESCENT
IMPERVEX TRENCHWIRE

For Underground Use

● CRESCENT IMPERVEX TRENCHWIRE provides the LOWEST COST, PERMANENT underground installation for services from power line to meter, for connecting several buildings from the same service, as on FARMS, ESTATES and INSTITUTIONS and for STREET, AIRPORT, BALL PARK and other outdoor lighting and power circuits.

● CONSTRUCTION. The single copper conductor is insulated with IMPERVEX special moisture and heat-resisting rubber insulation. A tough NEOPRENE armor sheath is vulcanized over the insulation, protecting it from injury during and after installation. The cable is flame-retarding and practically UNAFFECTED by water, oil, acid, alkali, sunlight and exposure to the earth or weather;—nothing to rot, rust or corrode.

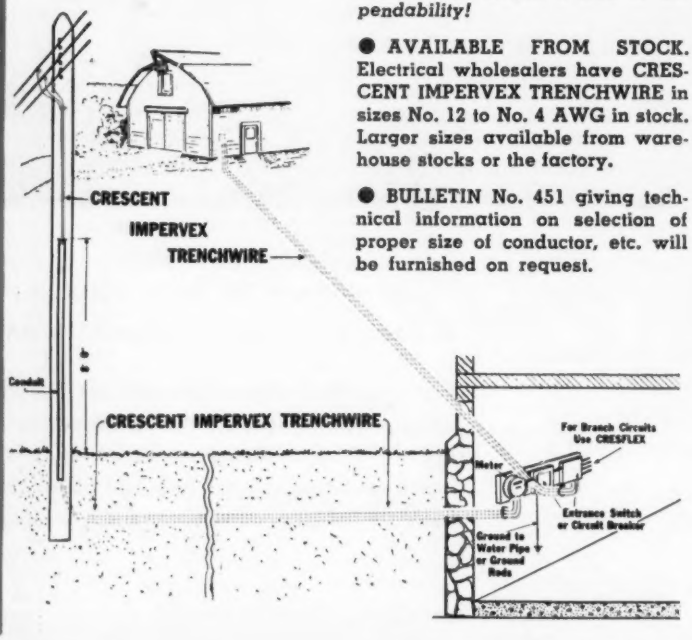
● EASY INSTALLATION. Two or more IMPERVEX TRENCHWIRES are laid together in a narrow trench to form the cable with no additional protection normally required.

● APPROVED. Carries Underwriters' Laboratories' Labels as TYPE USE—Underground Service Entrance Cable, and conforms to the National Electrical Code.

● PROVEN. Tens of millions of feet of CRESCENT IMPERVEX TRENCHWIRE have been installed over the last seven years under all types of installation conditions, with not one case of failure reported—*a unique record of dependability!*

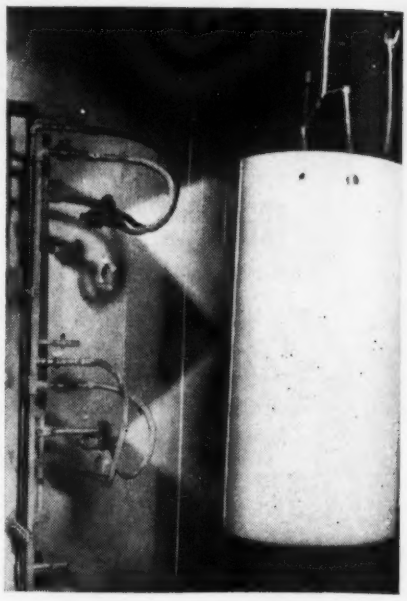
● AVAILABLE FROM STOCK. Electrical wholesalers have CRESCENT IMPERVEX TRENCHWIRE in sizes No. 12 to No. 4 AWG in stock. Larger sizes available from warehouse stocks or the factory.

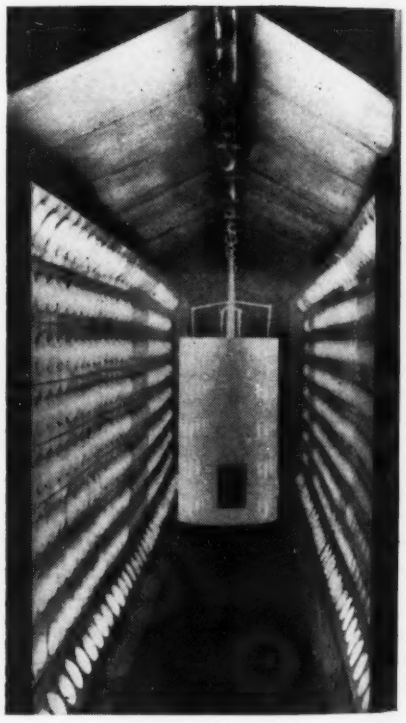
● BULLETIN No. 451 giving technical information on selection of proper size of conductor, etc. will be furnished on request.



CRESCENT
WIRE and CABLE
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

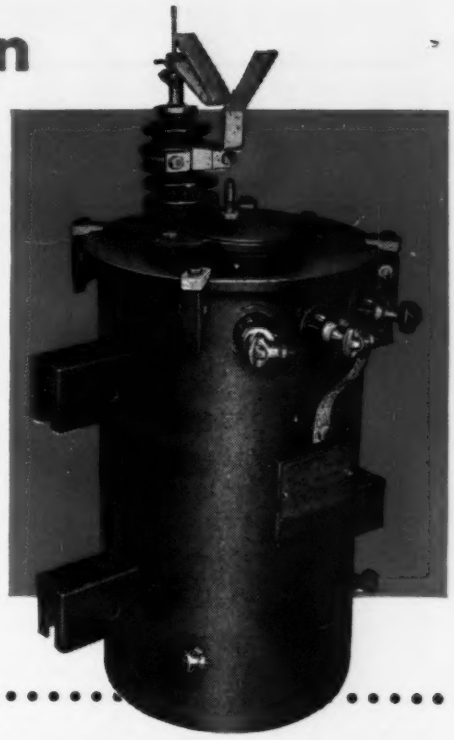
Electrical Production of Electrical Products





ELECTROSTATIC SPRAYING and infrared heat increase output and reduce costs for the M. M. Hedges Mfg Co, Chattanooga, Tenn. Shells for the company's "Mertland" storage heater are shown in the spray booth and baking oven. They pass through the electrostatic field set up by a pair of grids charged to 130,000 d-c. Only one of the grids is shown. The particles of enamel dispersed by the spray heads are directed to the object which is at ground potential. Overshooting and consequent loss of enamel are reduced; and the coating is more evenly applied. The infrared baking oven draws about 170 kw. This method of finishing heater shells results in greatly reduced production costs and considerable savings in time and effort.

Performance *plus* Protection



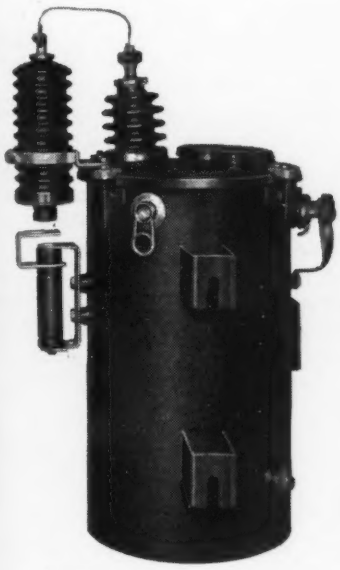
No matter what your requirement may be, Wagner can supply the *right* rural-line transformer for your need. Type HEF-5, illustrated at right, features a double "bird-proof" gap to provide surge protection and an internal fuse to form a protective link between the transformer and the high voltage line. When the double gap and internal fuse are combined no other surge protection or transformer fuses are required.

Wagner Rural-Line Transformers are nationally known for their high standard of quality and performance. They are establishing enviable records in the field, upholding the Wagner reputation for dependability earned during our half-century of designing and building distribution and power transformers.

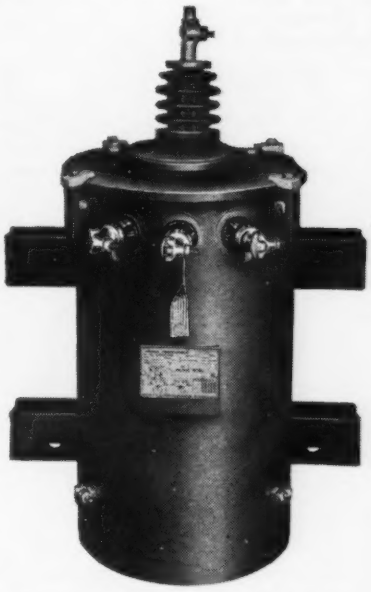
Wagner makes a complete line of Rural Transformers

Get performance plus protection by selecting the type that meets your requirements from Wagner's complete line. Full information on Wagner Rural-Line Transformers is given in Bulletin TU-1C. Write for your copy today.

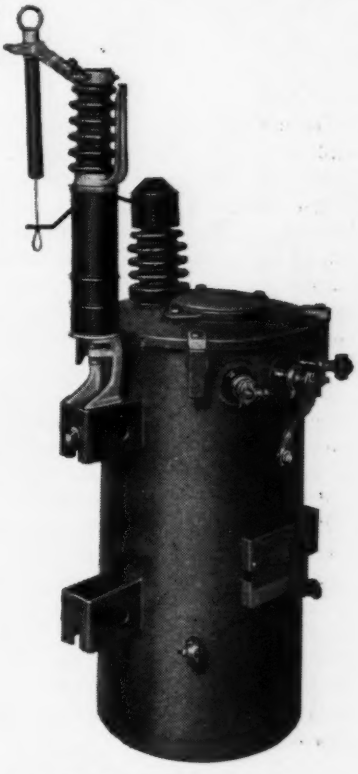
Wagner Electric Corporation
6456 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.



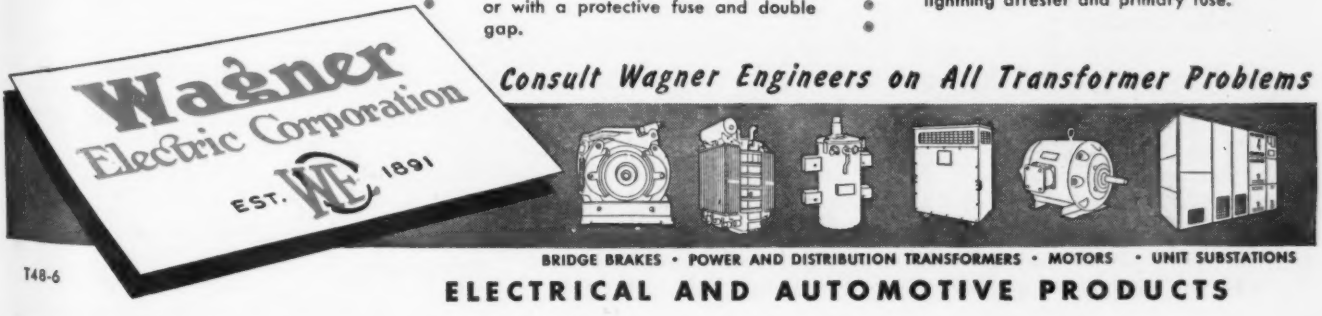
Type HEF-3: Completely Self-Protected Rural-Line Transformer. De-ion Gap on high-voltage side provides surge protection; secondary circuit-breaker provides overload protection.



Type HEF: Conventional Rural-Line Transformer. Also available with protective fuse in the high-voltage bushing, or with a protective fuse and double gap.



Type HEF-7: Protected Rural-Line Transformer. Equipped with expulsion-type lightning arrester and primary fuse.



Consult Wagner Engineers on All Transformer Problems

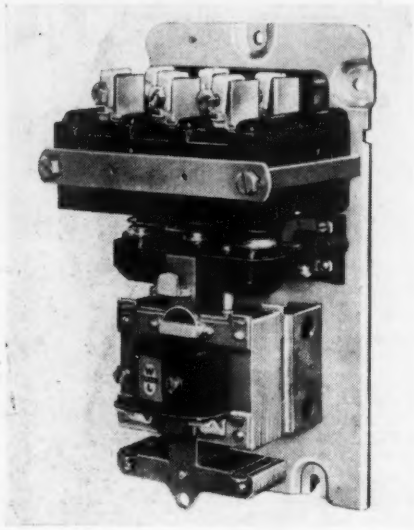
BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL AND AUTOMOTIVE PRODUCTS

T48-6

NEW EQUIPMENT

Solenoid Contactors



NEWLY DESIGNED size 2 Bulletin 4452 and size 3 Bulletin 4453 a-c solenoid contactors have been announced by Ward Leonard Electric Co, Mount Vernon, N. Y. Intended primarily for use in a-c motor controllers, these contactors are also suitable for application in resistive heating controls, lighting controls, and for remote and automatic load switching purposes.

Some features include: parts arranged on steel mounting plate, compact unit construction, accessibility of parts, built-in solderless connectors, and double-break silver contacts.

Size 2 and 3 units have maximum ratings of 25 and 50 hp respectively on 440-550 v, 3 phase, 60 cycles. Standard operating coils with front-connected terminals are available for 110, 220, 440 and 550-v operation on 25. 50 or 60 cycles. Additional auxiliary contacts for control circuit purposes are also obtainable.

•

200-W Lamp

A NEW 200-w R40 Hi-Flood lamp with medium base that fits fixtures for 150-w PAR lamps is now being made by Radiant Lamp Corp, 300 Jelliff Ave, Newark 8, N. J. This lamp is said to produce 33% more light than the maximum size lamp which could heretofore be used with that type fixture.

The new lamp is made of heat-resisting glass, and has a sealed-in silver reflector. The glass is reported to resist moisture, sleet, insects, and vibration without cracking.

•

Self-Contained Gearmotor

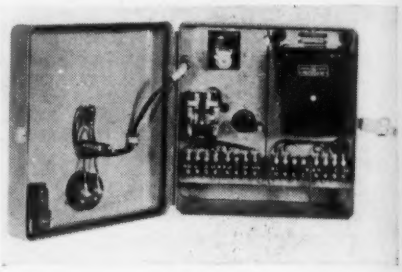
A NEW VERTICAL gearmotor is the latest addition to the gear drive line produced by Westinghouse Electric Corp, East Pittsburgh, Pa. Each unit is a self-contained drive, consisting of a high speed motor and speed reducing unit. Nine different gear ratio combinations are available, ranging from 7.61:1 to 38.9:1.

These gearmotors are available in 3 to 50 hp, 220, 440 or 550 v, 3-phase, a-c, and 3 to 7½ hp, 115 or 230 v, d-c. They may be equipped with practically any standard motor in a variety of enclosure types including open pro-

tected, semi- or totally enclosed, and explosion-proof.

Special features in this new vertical gearmotor are: (1) In the design of the gear case all gears and bearings receive positive lubrication at all operating speeds; (2) quiet operating, single helical gears and pinions of 40 to 50 carbon steel are given the exclusive Westinghouse BPT "tough-hard" heat treatment before hobbing; (3) maximum strength and tooth overlap; (4) uniform loading—slow uniform wear; and (5), lower impact stresses from sudden shocks or reversals.

Combustion Control System



A NEW PHOTOELECTRIC combustion control system for commercial oil burners has been announced by the Control Division of the General Electric Co, Schenectady, N. Y. It is composed of a master control unit, a phototube unit, and an electrode unit. The new system is designed to shut off the flow of fuel to an oil burner immediately if the oil fails to ignite or if the flame is extinguished after successfully igniting. On gas-electric ignition systems it is said to prevent fuel from flowing if the gas pilot does not ignite.

The control system allows the burner motor to operate for a definite period after shut-down or combustion failure in order to purge the nozzle or cup of unburned fuel, thus preventing carbonization and reducing servicing. The system is locked against further operation after a failure to start, until manually reset. A light on the cabinet cover indicates when the equipment has gone to lock-out.

•

Spot Welder

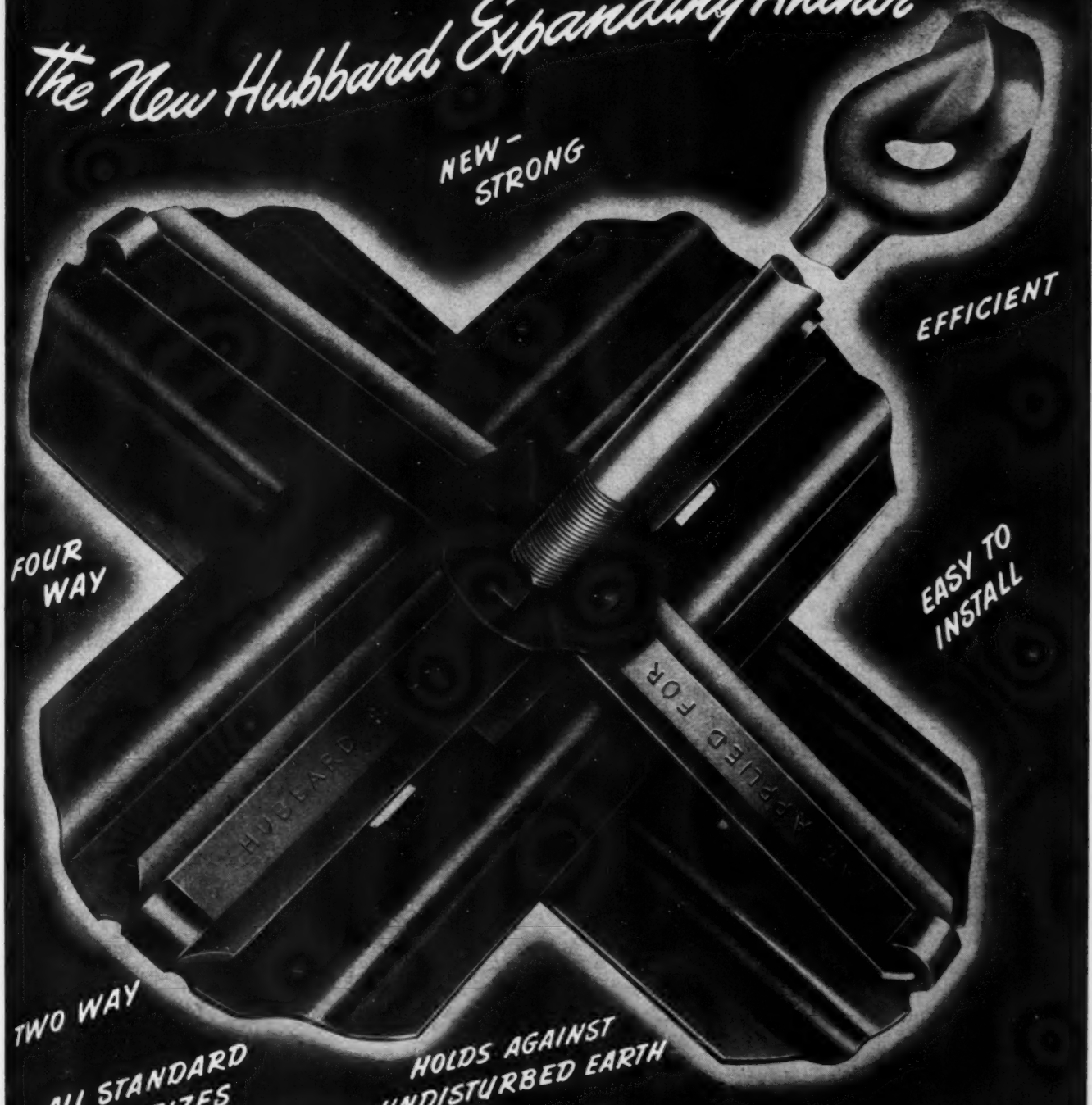
A NEW FOOT-OPERATED spot welder of the pivot type is announced by Agnew Electric Co, Milford, Mich. It is identified as type "J" and is furnished in 12, 18, and 24 in. thread depths with 10-kva transformer. The transformer is glass insulated and has a very short secondary circuit.

A 4-point tap switch is provided with "off" position for set-up purposes. A magnetic contactor and automatic switch pass current only after pressure is applied to work. Machine is furnished with disconnect switch mounted and wired, ready for operation on connection to single-phase a-c power supply.

Both horns are adjustable, in and

HUB-ANCHORS!

The New Hubbard Expanding Anchor



NOW IN PRODUCTION... WATCH FOR DETAILS!

HUBBARD AND COMPANY

PITTSBURGH · CHICAGO · OAKLAND · CALIFORNIA

It takes QUALITY PERFORMANCE to get an ENCORE . . .

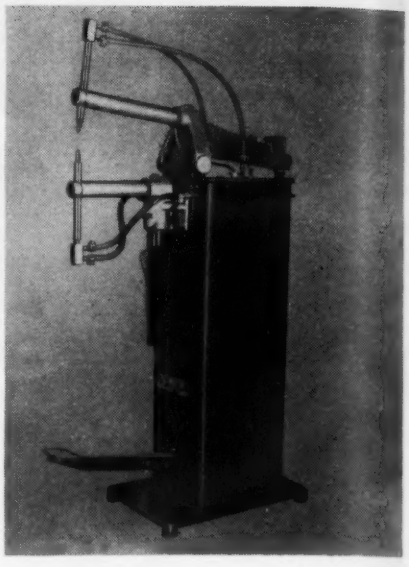
and YORK-HOOVER BODIES get "encore orders" time after time

The fact that operators everywhere keep re-ordering York-Hoover Bodies is proof of their confidence in and approval of the York-Hoover product.

Specific purpose design to do a particular job, experienced and skilled engineering for dependability, and honest workmanship for economical maintenance and low depreciation—all contribute to this customer confidence and approval.

To meet this healthy, steadily growing demand, York-Hoover has increased plant and production facilities so that we hope to say "prompt deliveries" in the not-too-distant future.

YORK, **YORK-HOOVER BODY DIVISION CORPORATION** PENNSYLVANIA

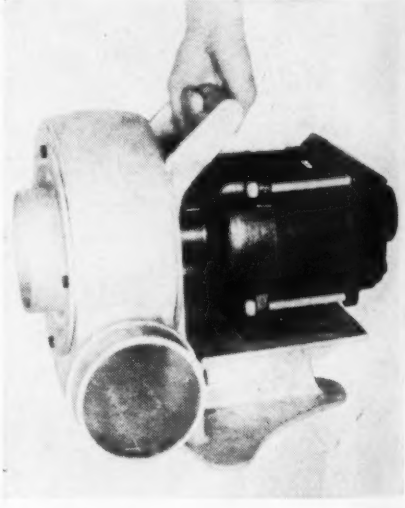


out, and can be rotated. The lower horn can be swiveled and also reversed for getting into deep places. Floor space is 15 x 18 in. plus throat depth.

•

Portable Ventilator

A MOTOR-DRIVEN aluminum ventilator usable as a blower or exhauster has been made available by United Electric Motor Co, 178 Centre St, New York 13, N. Y. It can be applied to remove gases, vapors, dust from manholes, boilers, tanks and other inaccessible places.



Known as "Saf-T-Air," the unit has a capacity of 425 cfm, weighs 50 lb, and is provided with a handle over the center of gravity.

•

Fluorescent Fixture

NEW "LIGHT-IN-LINE" fluorescent lighting fixtures manufactured by Moe-Bridges Corp, 15th Stand Illinois Ave, Sheboygan, Wis, have as one feature a cover-plate that can be removed or re-

Engineered and Tested for TOUGH Operating Conditions

Superior Performance for Disconnecting, By-pass or Sectionalizing.

Blade in Correct Position before it ROTATES In and Out of Contact Position; Less Wear.

Solid-Silver-to-Solid-Silver Easily-Adjustable High-Pressure Contacts.

NEMA BIL Insulators & Open-Gap Spacings.

PACIFIC ELECTRIC Rotating Blade Air-Break Switch Type TW

7.5 kv. to 230 kv.; 400, 600 and 1200 amps.

Gang Operated, Rotating Insulator, Vertical Break. Suitable for Horizontal-Upright or Inverted Mounting. Vertical Mounting to 161 kv.

Widely-spaced Bearings for Rotating Insulator.

Hinge End has Bevel-Link Drive, Operating Lever and Link, for Simple, Positive Operation.

Stiff Bases Assure Perfect Alignment.

High Conductivity, Non-ferrous Current-Carrying Parts.

Utilities everywhere rely upon this switch because it is dependable under severe operating conditions. It is of simple design, toggles in closed position, has enclosed spring to counterbalance the blade of larger sizes, and easy adjustments: for positioning the blade and for rotating the blade. Manual and automatic controls available. Meets all A.I.E.E. and N.E.M.A. Standards.

For Full Details, See Our Bulletin No. 82.

Call **PACIFIC ELECTRIC MFG. CORPORATION**

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • P. O. BOX 419, GARY, INDIANA

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912 Securities Bldg.
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A. A. MARRS
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G. B. KIRKWOOD
437 S. Hill St.
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KRIPPNER AND POLLEY
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Denver 9, Colo.

WILLIAMSON & WILMER, INC.
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HAWORTH L. BRUECK CO.
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J. E. REDMOND CO.
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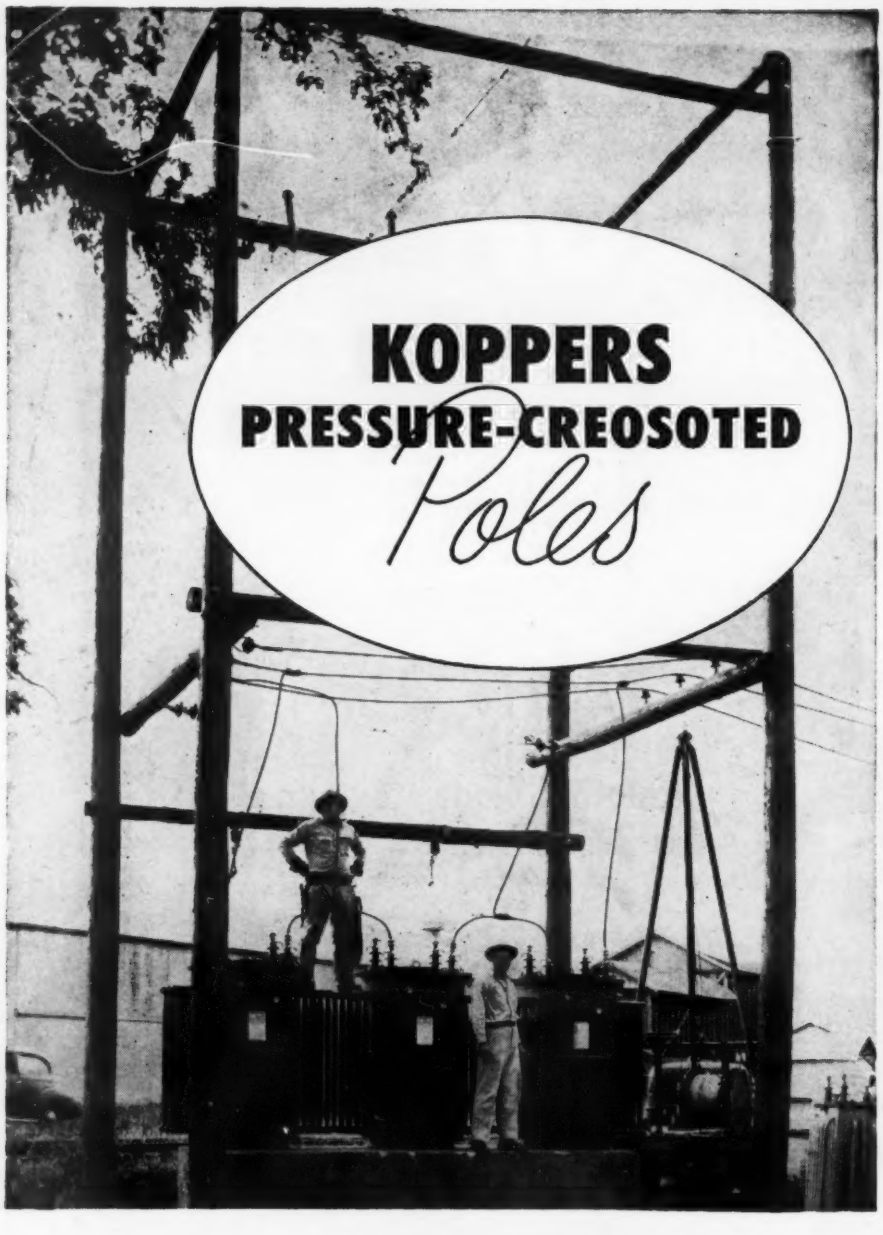
Phoenix, Ariz.

Other Representatives in Principal Cities



PAST PERFORMANCE

is YOUR *best yardstick*

There's no margin for error or experiment in Utility pole installations. Dependability is *always* a "must."

Koppers Pressure-creosoted Poles, backed by long experience in the manufacture and processing of forest products . . . by constant and intelligent research . . . and by a record for long life and low costs, have a history that certifies their performance.

Prompt deliveries are assured from conveniently located treating plants. Ample facilities permit stocking of all needed quantities and sizes for contract treatment or out-of-stock shipments.

K KOPPERS

PRESSURE-TREATED WOOD

KOPPERS COMPANY, INC.

PITTSBURGH 19, PA.

placed quickly. The operation is achieved through the use of standard Shakeproof Q-Two-Fastener.

One such fastener at each end of the cover plate is said to hold it securely in place under constant spring tension, resisting vibration and loosening. The fasteners consist of three pieces—a wing-head stud with "lugs" at its tip, a retainer washer, and a spring cam receptacle to engage the "lugs" on the stud.

•

Test Connector

FOR USE WITH watthour meters such as having A-base construction, a test connector has been designed by Eastern Specialty Co, 3617 North Eighth St, Philadelphia 40, Pa.

Milled head is slipped sideways over head of meter terminal screw so that key edges engage slot under the screw head. Interior plug soldered to lead is forced against head of terminal screw as two halves of the connector assembly are screwed together.

The connector has an insulated sleeve over a brass body, is $\frac{11}{16}$ in maximum diameter, $2\frac{13}{16}$ in. long, has plug drilled and tinned for No. 4 stranded wire maximum, and can be furnished with or without leads.

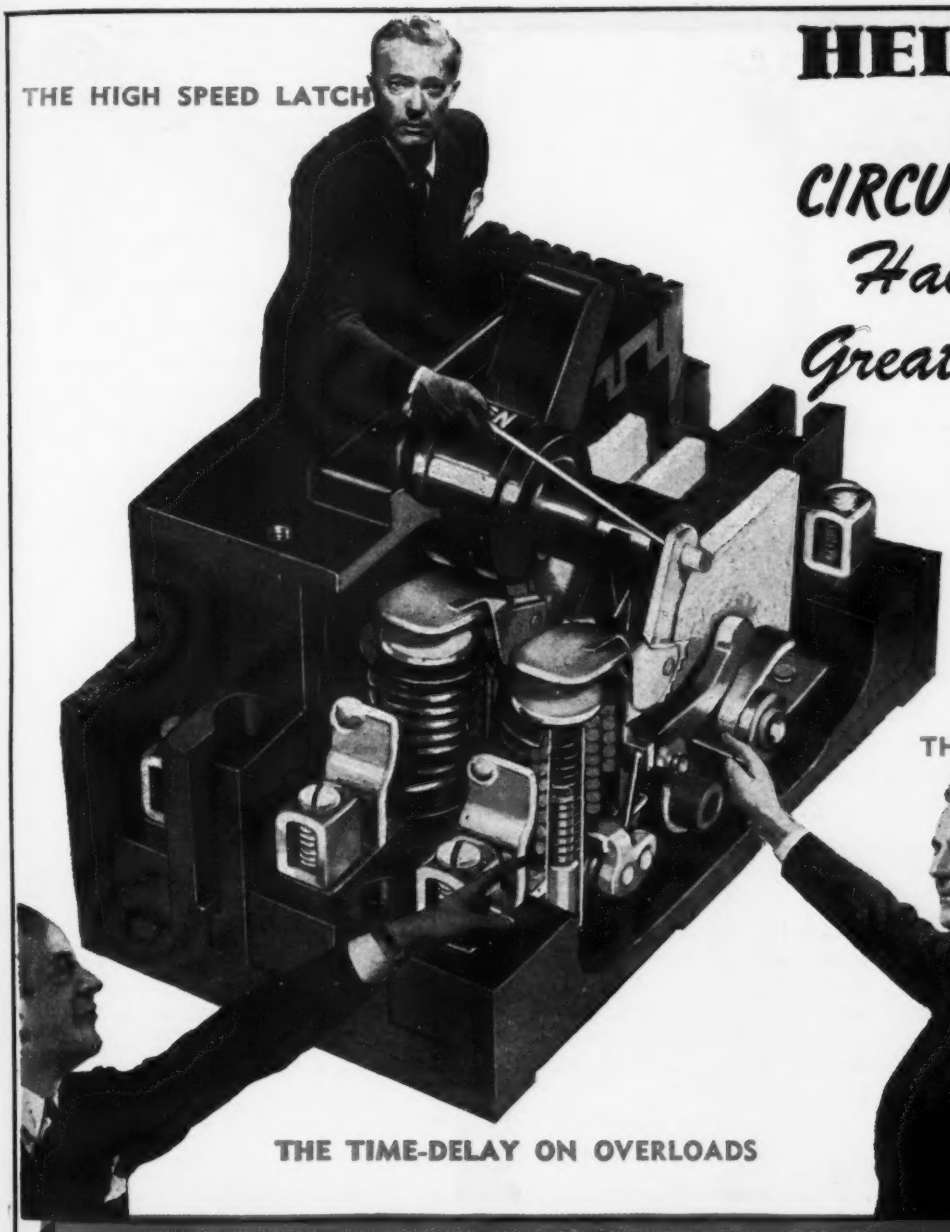
•

Industrial Fixture

"WEATHERIZING" IMPROVEMENTS have been introduced in the HF-100 industrial fluorescent fixtures manufactured

HEINEMANN
MAGNETIC CIRCUIT BREAKERS Have THREE Great Advantages

THE HIGH SPEED LATCH



THE HIGH SPEED BLOWOUT

THE TIME-DELAY ON OVERLOADS

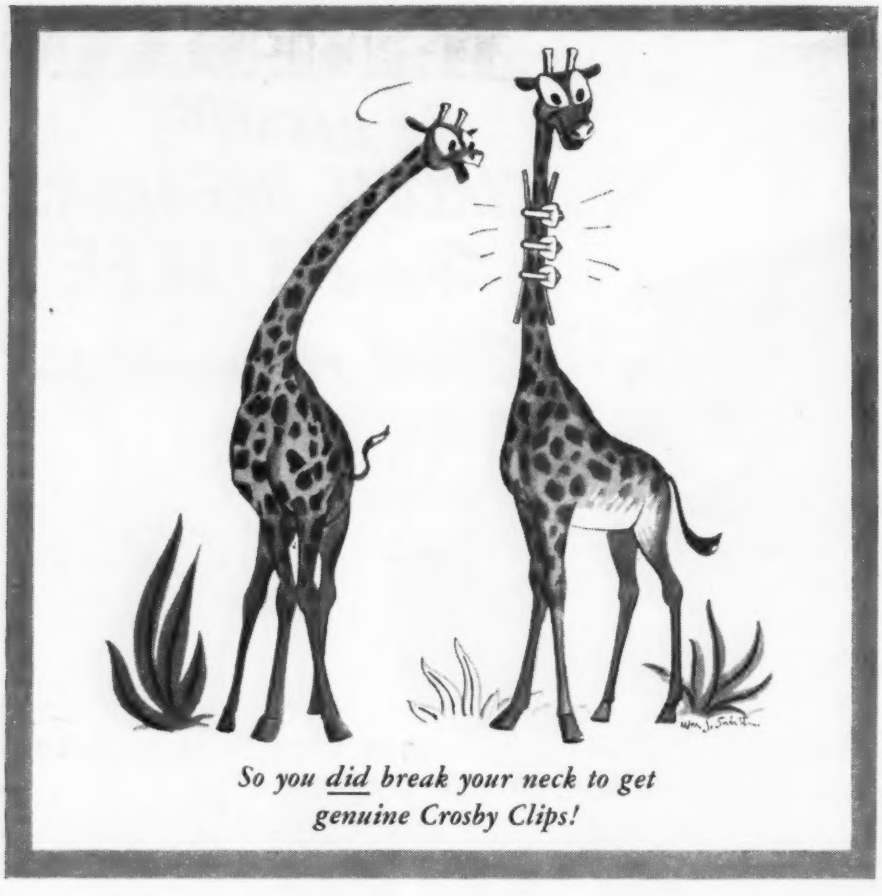
Above sketch shows the action of the Time Delay Tube, which prevents the breaker from opening on sudden inrush current, but allows it to open on sustained overloads. This is done by means of the plunger action in the liquid-filled tube. The speed with which the plunger is drawn toward the magnetized pole piece depends on the viscosity of the liquid. (At left —plunger in normal position. At right — after overload has attracted plunger to pole piece, opening contact).

The Latch Mechanism performs two functions: (1) It opens the breaker with the least mechanical delay, and (2) It opens the breaker independent of handle operation. Of all known latches, this mechanism operates with the least amount of friction and with the greatest speed. The latch collapses only under overload or short circuit conditions—and it does that even if the handle is held in the "on" position.

Speed is added to the arc interruption by means of the High Speed Blowout shown above. Magnetic blowout contacts are mounted in individual arcing chambers, carefully insulated from each other. These add speed to the arc interruption. As the value of the current to be interrupted increases, the quenching effect becomes greater, due to the intensified magnetic blowout field.

HEINEMANN ELECTRIC COMPANY

103 PLUM STREET — ESTABLISHED 1888 — TRENTON, N. J.



So you did break your neck to get genuine Crosby Clips!

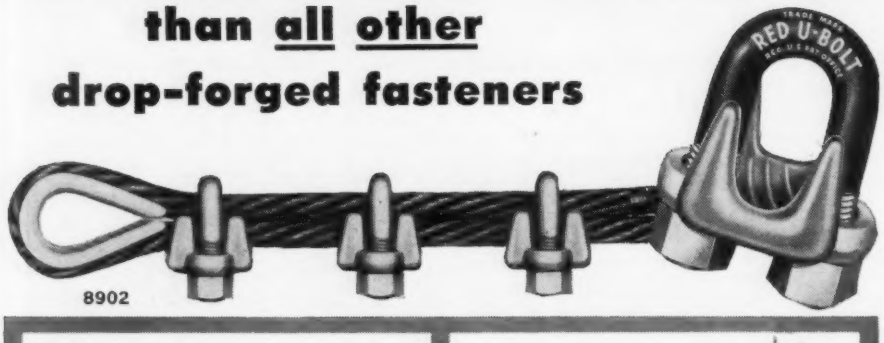
Why stick your neck out, in buying wire rope fasteners? The difference in cost between genuine CROSBY CLIPS and the cheapest fasteners you can buy is certainly not much of an item. CROSBY CLIPS are *drop-forged*—not cast. Channel grooved base, high side wings, chamfered bolt ends, are priceless features of quality. Sold by distributors everywhere, in sizes from ⅛" to 3".

Made only by AMERICAN HOIST & Derrick Co., St. Paul 1, Minnesota.

Industry uses more

CROSBY CLIPS

than all other drop-forged fasteners



8902

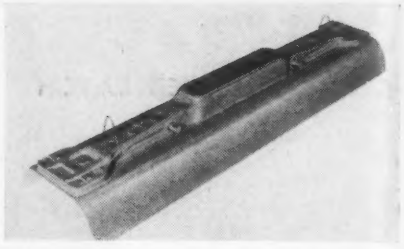
For Armored Construction . . . specify

AMERICAN BLOCKS AND SHEAVES

● A complete line of wire rope blocks—all types, all sizes, in capacities from 1½ to 250 tons. Thick steel side plates, heavy pins and axles. Ask for American equipment when ordering.

ONE MAN LIFTS 10,000 LBS. WITH THE AMERICAN HANDIWINCH

● Gives one man the power of a crew. Weighs only 95 lbs. Handles lifting, loading and pulling jobs up to 5 tons. All steel construction. Ask your distributor.



by Sylvania Electric Products Inc, Salem, Mass.

The weatherized finish on the reflector protects the metal fixture parts and provides a reflection factor of 86%. The turned-down reflector lip minimizes collection points for dust, lint and moisture.

Tophousing is made from a single sheet of steel. A wide flange adds strength and rigidity. Single hanger hooks shown provide for ease of installation. Designed for a two-lamp fixture, the HF-100 is equipped with knockouts to provide for a third lamp if greater light tensity is desired.

•

Impact Nut Setter

A PORTABLE ELECTRIC reversible, impact nut setter has been introduced by Illinois Gage & Mfg. Corp, 4639 West Washington Blvd, Chicago 44, Ill. The Speed-o-matic unit operates at 1750 rpm and is reported to have a capacity for driving bolts and nuts up to ¾ in. At point of resistance, impact unit automatically delivers 3000 blows per minute.

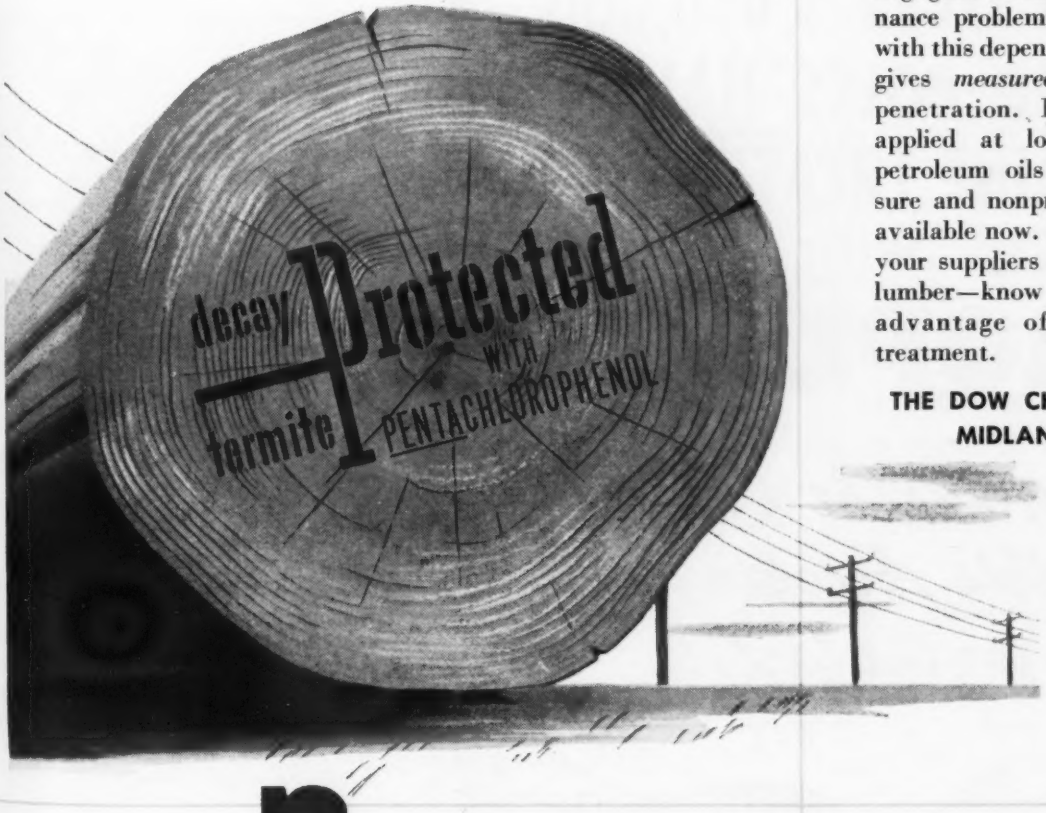
The unit is reversible for removing bolts or nuts, has a 110-v universal motor, and is equipped with 25-ft cord and plug with ground wire. Overall length is 12½ in. and weight is 13½ lb.

•

Selenium Rectifier

A 9-v, 2,500-AMP selenium rectifier has been introduced by the Bart-Messing Corp, 45 Morgan Ave, Brooklyn 6, N. Y. This unit was primarily designed to permit a reserve of voltage for platers desiring to use diluted solutions of chromic acid or other baths to conserve

You get full strength preservative with PENTAchlorophenol!



There's no guesswork when you use Pentachlorophenol treated poles! You get full strength preservative . . . positive, tested protection against decay and termites. Pentachlorophenol is effective through the years because of its low volatility and negligible solubility in water. Maintenance problems are minimized, too, with this dependable preparation that gives *measured* control and deep penetration. Pentachlorophenol is applied at low concentrations in petroleum oils by established pressure and nonpressure methods. It is available now. Make sure today that your suppliers of treated poles—and lumber—know you want to take advantage of this *modern* wood treatment.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

3 MORE BIG PENTAchlorophenol advantages

1. You know what you're getting with Pentachlorophenol—measured dependable preservative action.
2. You can duplicate service records. Treating solution is scientifically controlled.
3. You get a *clean* treatment—nonbleeding, nonsticky, poles are easy to handle and work on.

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

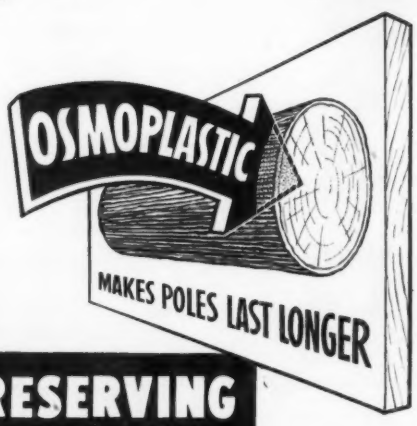
DO YOU KNOW ?

THAT OVER 3,000,000 STANDING POLES* HAVE BEEN GROUNDLINE TREATED TO DATE WITH

OSMOPLASTIC

There must be a Reason for this Acceptance - Write for the facts!

*WORK PERFORMED ON 68 LEADING UTILITY PROPERTIES



OSMOSE WOOD PRESERVING COMPANY OF AMERICA, INC.
GENERAL OFFICE AND PLANT: BUFFALO 12, N. Y.

their limited supplies of critical materials.

Some features claimed: efficiencies over 72% at full load, up to 83% at 20% load; tap switch adjustment of output; selenium elements have over 7700 sq in. of effective rectifying area (approx. 310 sq in. per 100 amp) and are triple impregnated for corrosion protection; fans; overload protection; instruments; magnetic starter and push buttons; mounted on casters for mobility.

The unit is 60 in. high, 26 in. deep, and 38 in. wide. It can be used on 200, 220, and 440, 3-phase, 60-cycle service.

•

Flashing Street Beacon

AN EMERGENCY WARNING beacon type RFX with flashing red light is a recent development of Carpenter Manufacturing Co, Boston 45, Somerville, Mass. The complete unit consists of a lamp and standard mounted on a cast aluminum box containing a rechangeable battery.

The beacon is adaptable for use by public utility crews when working in streets. The flashing light is reported to be high enough (5 ft above battery box) to be seen above automobiles and is visible from a great distance. The standard is detachable and can be set in a bracket fastened to side of repair truck, so that the light can be operated from the automobile battery when that procedure seems better.

•

Wire Rope Hoist

A NEW LOW-CAPACITY, light-duty cable and drum hoisting unit, designated as the Load King, has been developed by Yale & Towne Mfg Co, 4530 Tacomy St, Philadelphia 24, Pa. It is available in ¼, ½ and 1-ton capacities.

Frame of the portable hoist is a steel casting constructed for use with lug, plain trolley, motor trolley, or winch-type mounting. Drum has machine-cut grooves and capacity for

is expanding

Elliott deaerating heaters go along with new power units

If you want to spot the areas of industrial expansion, watch the new power plants going up. Or, since practically all modern power plants use feedwater deaeration, note the many Elliott deaerating feedwater heaters which first appear high up on each building's framework—symbol of modern economical power generation. The illustrations opposite show a few of many installations in the south, where power generation is keeping pace with industry's growth.

Elliott deaerating heaters furnish feedwater heated to saturated steam temperature while removing corrosion-causing oxygen and dissolved gases. Two essential services in one package.

Elliott Company pioneered deaeration and has unrivalled experience in the design, construction, and application of deaerating units. Elliott engineers can fit the deaerating heater to your requirements in size, capacity, and operating conditions. They can often help with your heat balance problems.

Do you have Bulletin N-15 — "Deaeration by Elliott"?

Shop view of a 600,000-lb-per-hr unit, typical of a number now in service in various southern plants.

N-991

COMPANY
Deaerator and Heater Department
JEANNETTE, PA.
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

STEAM TURBINES • GAS TURBINES • GENERATORS • MOTORS • CONDENSERS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES
TUBE CLEANERS • STRAINERS • DESUPERHEATERS • FILTERS

State quilting champ . . . but she uses an electric blanket!

The modern farmer's wife knows that electric blankets, irons, and vacuum cleaners aren't just for city folks . . . no sirree!

Through rural electrification programs, more and more farm people are enjoying the full benefits of modern electrical equipment.

Hemingray Power Insulators play an important part in rural electrification. These glass insulators, designed for medium voltage power lines, fill all requirements for this purpose.

Hemingray Power Insulators are approved by the Technical Standards Committee of the Rural Electrification Administration under the limits of AIEE Specification No. 41-1944.

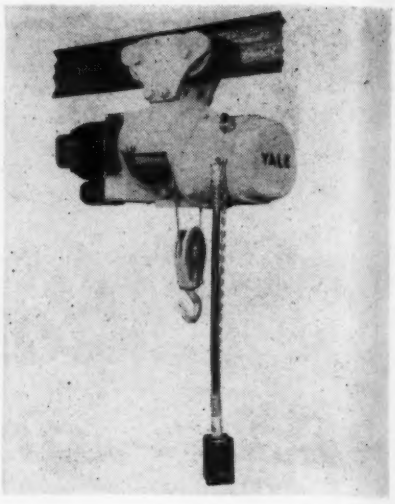
HEMINGRAY

POWER INSULATORS

American Structural Products Company

MUNCIE, INDIANA

SUBSIDIARY OF OWENS-ILLINOIS GLASS COMPANY

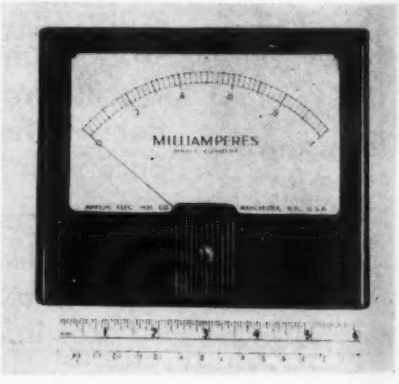


standard lift without overlapping of cable. Reversible motor is rated to operate under constant service with full load and without destructive overheating.

•

Large Dial Instrument

WITH A LARGE dial that may be easily read at a distance, a rectangular bakelite-cased meter has been developed by the Marion Electrical Instrument Co, Manchester, N. H.



The model 56 for electronic manufacturers has case dimensions 6½ in. x 5¼ in., has a scale with 100-deg arc and 5½-in. long, and also a large open face making it adaptable to multi-arc dials. It uses Alnico II magnets in normal ranges and Alnico V in the microammeter ranges.

MORE NEW PRODUCTS about which you should know

Milwaukee Resistor Co, Milwaukee, Wis., is producing a round **resistor** on which the ends of the core are plated with copper and serve as ferrules. . . Lenk Mfg Co, Boston 15, Mass, announces availability of 75, 100 and

150-w, 110-v a-c, **soldering irons** with metal-clad heating element and fin-type heat dissipators near the handle... Mueller Electric Co, Cleveland 14, Ohio, has developed No. 11-HL, 200-amp, 1-in. wide **terminal clip** with insulated handle grip for attaching to batteries.

Redmond Co, Inc, Owosso, Mich., is manufacturing 6-pole, 1/15-hp ventilated and 1/20-hp totally-enclosed shaded pole **motors** designated type Y. . . Automatic transportation Co, Chicago 20, Ill., announced 1948 Transporter electric **trucks** of 3000, 4000 and 6000-lb capacities having new foot-operated lift pump for raising the load. . . Metallizing Engineering Co, Inc. Long Island City 1, N. Y., has a **metallizing gun** said to weigh 4⅛ lb and require only 10 cfm of air for the process; another product is Sprabond, a **metallizing wire** which may be sprayed on smooth steel and other materials without surface preparation.

Wyzenbeek & Staff, Inc, Chicago 22, Ill. have a portable 32-in. high, 2-shelf, circular **handy-shop** with 1/3-hp motor and 5-ft flexible shaft, for "on-the-spot" repairs. . . H. K. Porter, Inc, Somerville, Mass., announces an improved manual cable and **wire cutter** with curved handles, 30% greater strength in sections and handles, and jaws marked showing capacity and type of material safely cut. . . Sola Electric Co, Chicago 50, Ill., has available 250, 500 and 1000-va, type CVH, constant voltage **transformers** said to have output which contains less than 3% total harmonic distortion... General Elec Co, Bridgeport, Conn, has a silent **mercury switch** with a 10-amp T-rating at 125-v ... Paul Valve Corp, New York 35, N. Y., developed a palm-size monel **valve** for hoze sizes ¼ to 1 in., delivering up to 13 gpm at 75 psi line pressure.

Electrical Saf-T-Plug and Devices Mfg Co, Los Angeles 15, Calif., is marketing a 10-amp, 250-v, duplex safety **plug receptacle** which plugs in and is fastened on the receptacle plate. ... Westinghouse Electric Corp, Pittsburgh 30, Pa., has available a type VRC-20 sports field **floodlight** with 1500-w lamp, narrow beam and 305,000 candlepower. . . Jefferson Electric Co, Bellwood, Ill., introduces its Wizard door bell **transformer** for quick mounting to outlet box or cover or to wall of fuse or switch cabinet; no separate plates required.

National Varnish Products Corp, Woodbridge, N. J., is producing Natvar 400, an extruded **vinyl tubing** in sizes No. 25, No. 20 to 0 inclusive, and ⅛ to 1½ in., reported approved for 105 C. ... United Condenser Corp, New York 54, N. Y., has a line of plastic dielectric **capacitors** in a wide range of voltage and capacitance, and in hermetrically sealed housing.

MOSINEE PAPER MILLS CO. MOSINEE WISCONSIN REG. U.S. PAT. OFF.

MOSINEE

"More than Paper"

In the field of electronics and the electrical goods industry, MOSINEE stands for paper-base processing materials with scientifically controlled chemical and physical properties, high quality standards and dependable uniformity... with good dielectric strength, high tensile or tear strength; proper softness or stiffness; creped with controlled stretch or flexibility; specified pH for maximum-minimum acidity or alkalinity; accurate caliper, density, liquid repellency or absorbency . . . or other technical characteristics vital to your quality standards and production requirements.

MOSINEE PAPER MILLS COMPANY • MOSINEE, WIS.

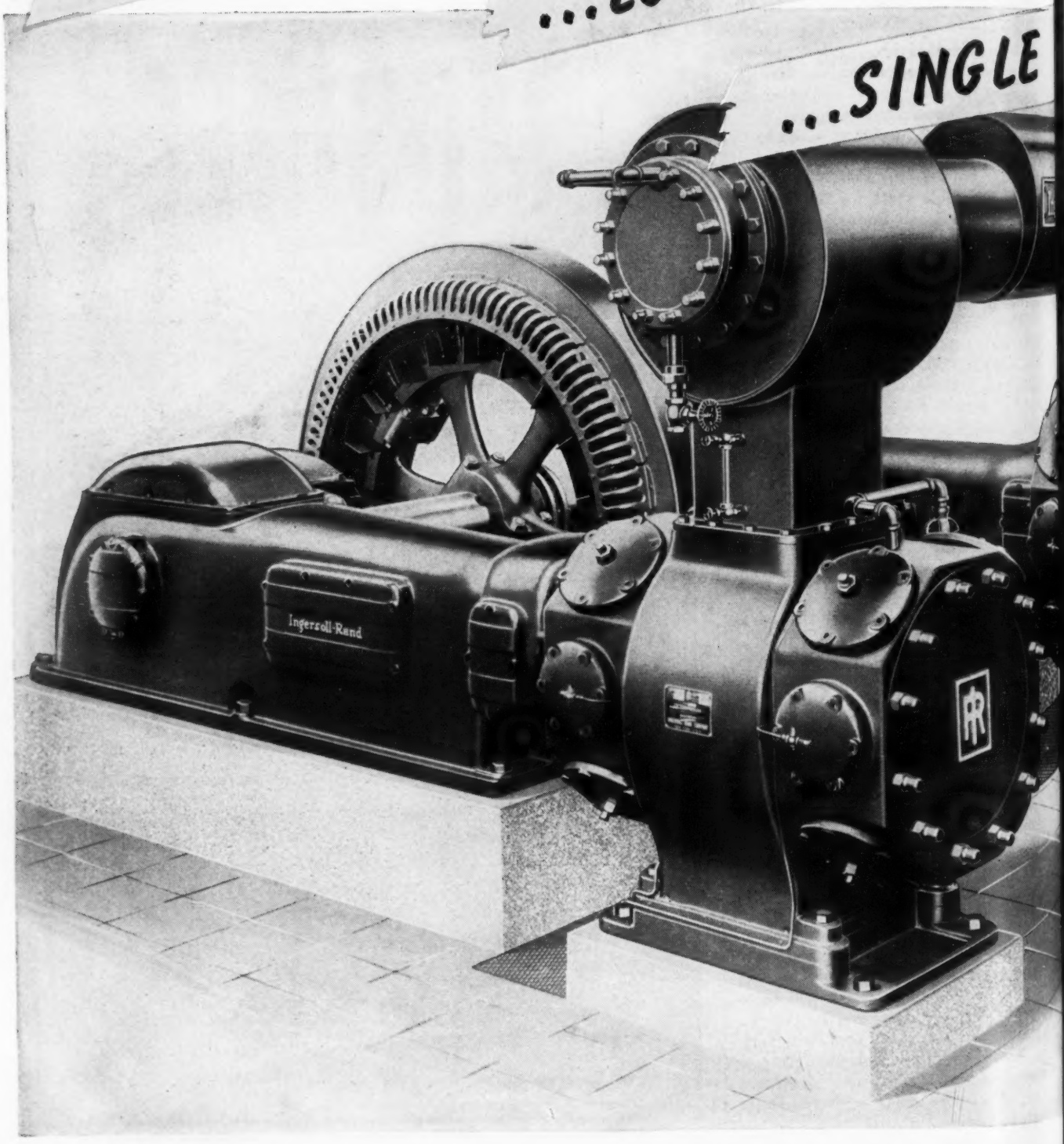
"Essential Paper Manufacturers"

RUBILENE OILS . .

. . . LARGE and SMALL

. . . LOW PRESSURE

. . . SINGLE



NEWS ABOUT PEOPLE

Fields, Cincinnati Gas VP, Made General Manager

Ernest S. Fields, vice-president in charge of the electric department, Cincinnati Gas & Electric Co, has been named general manager of that utility.

E. S. FIELDS

He will continue to serve as a vice-president and also as a member of the board of directors.

Mr Fields joined the Cincinnati utility in 1914 when he was a co-op student at the University of Cincinnati in the department of electrical engineering. His entire business career has been with the local utility and its subsidiaries. In 1929 he was named manager of the electric department; in 1943 a vice-president and two years later a director.

Active in the affairs of the American Institute of Electrical Engineers, Mr Fields has served as a vice-president and a member of the board of directors. From 1945-46 he was chairman of the engineering division of the Edison Electric Institute. At the present time he is chairman of the Committee for Coordination of Power Supply for the area embracing southwestern Ohio, all of Indiana, and parts of Michigan and Kentucky. This committee consists of operating executives of major utility companies serving that area.

•

▶A. D. VINING has been appointed general sales manager of the White Products Co, Middleville, Mich.

W. H. ARMACOST

Combustion Engineering Co Promotes W. H. Armacost

Announcement has been made by the Combustion Engineering Co, Inc, New York, of the appointment of Wilbur H. Armacost, vice-president, to the position of vice-president in charge of engineering. John Van Brunt, vice-president in charge of engineering for the past 25 years, has been appointed vice-president and consulting engineer.

A graduate of Armour Institute of Technology, Mr Armacost has been associated with the company and its affiliates since 1920. He was elected a vice-president in 1943.

Mr Van Brunt has long been recognized as an outstanding authority on the design of high-pressure boilers and fuel burning equipment. A graduate of Stevens Institute of Technology, he is a fellow of the American Society of Mechanical Engineers and a member of various other engineering societies.

•

▶M. B. MALLETT has been appointed chief engineer of the English Electric Co of Canada Ltd, St. Catharines, Ont., Canada, succeeding C. W. BAKER who has been made engineering consultant to the vice-president. Mr Mallett has been serving as transformer engineer for the company. He is a member of the American Institute of Electrical Engineers and of the Canadian Electrical Association. Active in the electrical engineering field for more than 40 years, Mr Baker has been chief engineer of the company for the past 14 years. He also is a member of AIEE.

Saunders Made Chairman of Ontario Commission

Robert H. Saunders, mayor of Toronto, Ont., Canada, has been appointed chairman of Ontario Hydro-Electric Power Commission. The position has been vacant since early last year when Dr Thomas H. Hogg resigned

In announcing the appointment Premier Drew of Ontario stated: "The

R. H. SAUNDERS

chairman will be responsible for administration and policy, while Richard L. Hearn, general manager and chief engineer, will have full responsibility for the management and direction of the engineering and business affairs of the commission, subject to decisions on policy by the chairman and the board."

Thrice re-elected mayor of his native city, Mr Saunders brings to his new position a wide acquaintance with municipal heads in Ontario. After graduating from law school. he entered the practice of law with Edward J. Murphy, former Crown Attorney, in 1928. Specializing in criminal law, he became one of Toronto's best known young criminal lawyers by the time he got into civic politics in 1935.

It was in 1945. after serving several years as alderman and on the Board of Control, that he was elected mayor of Toronto for the first time.

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▶C. A. BREWER has been appointed manager of Pend Oreille Electric Cooperative, Newport, Wash. He formerly

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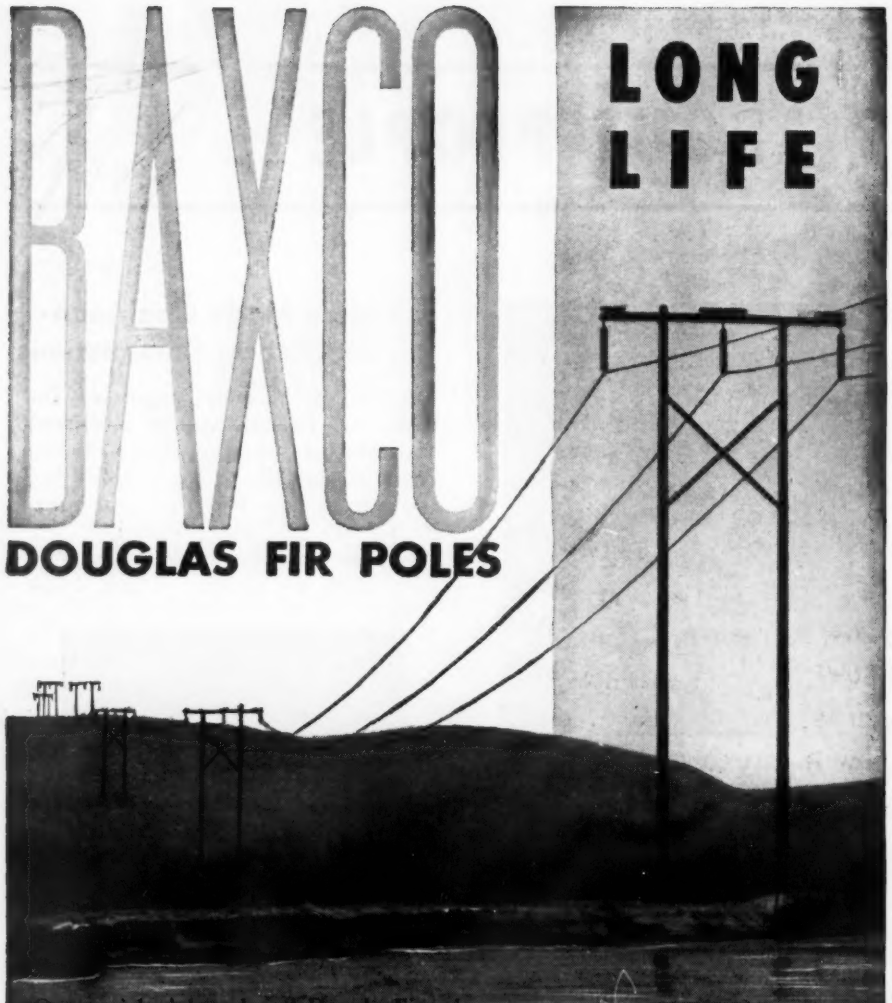
LONG LIFE
DOUGLAS FIR POLES



Our specialty is long-length Douglas Fir poles, pressure treated for Long-Life service. Prompt shipments of reasonable quantities can now be made in most lengths from 60 foot to 125 foot. Direct rail shipments out of our treating plant docks can be made to any point in the United States. Write or wire us your inquiries.

Pressure treated Douglas Fir poles have been for years the standard in pole line construction on the West Coast. BAXCO Long-Life Douglas Fir poles meet ASA Specifications and are pressure treated with coal-tar creosote or creosote-pentachlorphenol solution by the empty cell process, 8-lb. retention, in accordance with AWPA Specifications.

BAXCO Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut your maintenance costs and yield longer and more satisfactory service.

Also Produced by J. H. Baxter & Co. of Oregon—*an associated company*
Plant and Yard—Eugene, Oregon

J. H. Baxter & Co.

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LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

was associated with the Montana state water conservation board in Glasgow, and was project engineer for the Montana REA in charge of power lines in the northeast part of the state.

•

Dr T. von Karman Awarded John Fritz Medal for '48

Dr Theodore von Karman, aeronautical engineer, has been selected to receive the 1948 John Fritz Medal for scientific achievement. The medal will

T. VON KARMAN

be presented by the American Society of Mechanical Engineers when Dr von Karman, who is now in Europe, returns.

Dr von Karman was cited as a "creative leader, stimulating teacher and wise counselor in engineering and physical research in the fields of the aeronautical and structural sciences;" and he is being honored "for his many applications of mathematical and physical theory to the sound solution of engineering problems."

In 1938 Dr von Karman directed the Army Air Corps jet propulsion project at the California Institute of Technology, which later became a jet propulsion laboratory sponsored jointly by the Air Forces and the Ordnance Department. He became consultant for the Army Air Forces in 1939 and advisor at Wright Field, especially in wind tunnel developments. In 1944 he was made special consultant to General Henry H. Arnold and director of the Army Air Forces Scientific Advisory Group. In 1945 he headed a mission abroad engaged in the study and evaluation of technical developments in Germany, Japan, England and Switzerland.

From 1940-42 he developed a model supersonic wind tunnel at CIT and following this, he presented a memorandum to the Ordnance Department on the development of long-range rockets, which led to the rocket and jet propulsion developments carried on by the Ordnance Department at CIT.

Born in Budapest, Dr von Karman

A FRIENDLY

Announcement

ABOUT THE BUCKEYE PROCESS

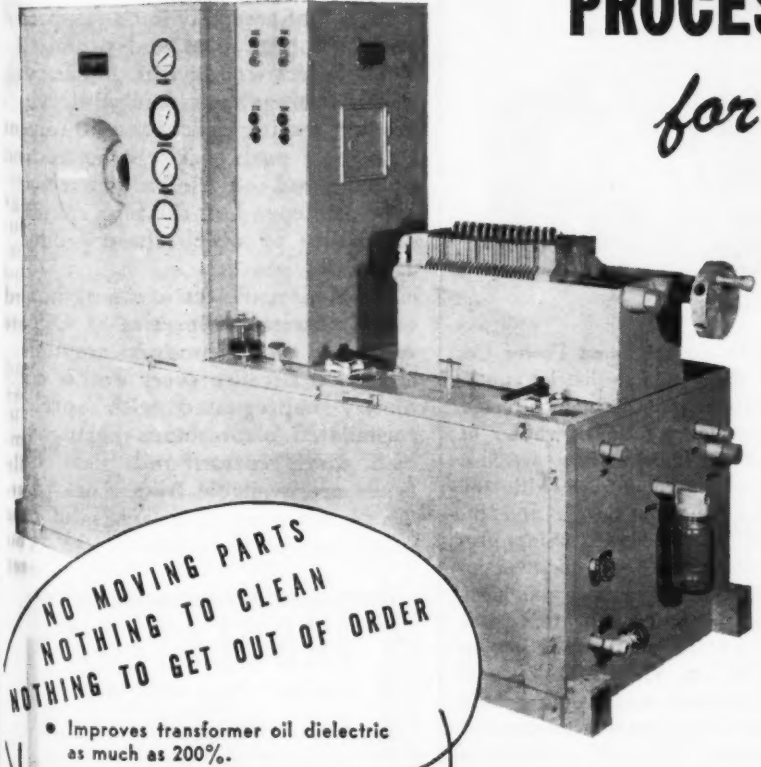
The manufacturing and marketing facilities of the BUCKEYE PROCESS Division of Buckeye Laboratories Corp., Cleveland, Ohio, were acquired by Bowser, Inc. as of December 30, 1947.

This facility for the production of processing equipment for transformer and other insulating oils is now a part of Bowser, Inc., broadening still further the scope of Bowser service in the field of oil handling and processing equipment.

BOWSER
ESTABLISHED 1885

PROCESSING EQUIPMENT

for TRANSFORMER and INSULATING OILS



NO MOVING PARTS
NOTHING TO CLEAN
NOTHING TO GET OUT OF ORDER

- Improves transformer oil dielectric as much as 200%.
- Increases transformer capacity.
- Prolongs oil service life.
- Effectively removes water, air, volatile corrosive agents and dirt.

The full resources of Bowser, Inc. in research, engineering, production and field service will be used to further the efficiency which has brought world-wide recognition to the Buckeye Process.

BUCKEYE PERSONNEL

The sales and service engineers of Buckeye Process are now a part of the Bowser staff of lubrication and filtration engineers servicing utilities and industries through 22 domestic field offices, and with representatives in all major world markets.

YOU ARE INVITED to write, wire or telephone us concerning your maintenance problems on transformer or other insulating oils. Prompt, courteous attention.

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LIQUID CONTROL SPECIALISTS SINCE 1885

Safe FOUR-SEASON
ROOM COMFORT
with

New HOWARD
Combination WARM OR COOL AIR
CIRCULATOR

The HOWARD works on new air-flow principles, gives your customers two useful units for the price of one. They get no-blast heating when the snow flies, no-draft air circulation when the temperature soars. The HOWARD is gentle as a baby's breath . . . quiet as a whisper . . . beautiful as a dream. No matter where they sit, they can't feel air currents from the HOWARD — but they do feel the effects in head-to-toes comfort, with every corner warmed or cooled to their liking.

And it's safe! Both fan and heating element are completely screened to protect precious baby fingers. The combination of HOWARD merchandising advantages, backed by an extensive national advertising campaign, makes this the unit to offer your customers. Follow the lead of Commonwealth-Edison, which has already accepted the HOWARD, by using the coupon below:

HOWARD INDUSTRIES, INC.
231 S. LaSalle St., Chicago 4, Ill.

Please send us complete information on Model A-1, which retails at $24.95.

FIRM NAME .....

ADDRESS .....
CITY, STATE .....

SIGNATURE .....

received his technical education abroad. Through lecturing at many universities and research institutions he was well known in this country when, in 1930, he settled permanently in California, becoming director of the Guggenheim Laboratory at CIT and director of research of the Guggenheim Airship Institute.

He was awarded the gold medal of the American Society of Mechanical Engineers in 1941 and the Medal of Merit in 1946. He is a member of the National Academy of Sciences, Royal Society of London and the French Academy of Sciences.

•

L.M.Moore Joins Consulting Engineers in Philadelphia

Lee M. Moore has joined the firm of Louis T. Klauder and Associates, consulting engineers, Philadelphia, as an electrical engineer.

Early in his career Mr Moore spent

L. M. MOORE

10 years with the Alabama Power Co, rising from draftsman to district superintendent at Selma, where he directed design, construction and operation of electric, gas and street railway systems.

His next assignment was with the REA in Washington, D. C., and St. Louis, from 1936 to 1948, rising progressively from associate engineer to principal engineer, technical standards divisions. In this latter capacity, he was in charge of technical consultation on special operating problems of rural power systems and supervision of field tests. He was in charge of all communication problems. As such, he was the REA representative in the development of rural telephone service over rural power lines at carrier frequencies, in collaboration with the Bell Telephone Laboratories. He has been granted two patents covering power line equipment and has been author and co-author of numerous technical papers.

A fellow of the American Institute of

with excellent push-back characteristics of
DIEFLEX

Ease of assembly is an important factor in both cost and production time of electrical devices. Dieflex varnished tubings and saturated sleevings are non-fraying products with unusually good push-back characteristics. Splicing and soldering are easier, and you can depend on the high standard of quality to which these products are made.

Flexibility, dielectric strength, and other physical properties of Dieflex varnished tubing products are unusually good because every one is completely impregnated with specially formulated oleoresinous baking varnish. Both cotton and glass fiber types are available from stock. You are always sure of getting the best when you specify Dieflex.

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ELECTRICAL INSULATION

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★ CLEVELAND 14, 1231 Superior Ave., N. E.
MILWAUKEE 2, 312 East Wisconsin Ave.
DAYTON 2, 1315 Mutual Home Building
DETROIT 2, 11341 Woodward Ave.

REPRESENTATIVES in MINNEAPOLIS 3, 1208 Harmon Pl., and PEORIA 5, 101 Heinz Court

Electrical Engineers, Mr Moore has served on the transmission and distribution, communication, membership and other committees of that association. He is also a member of the Radio Technical Planning Board for FCC.

•

W. W. Scott Assigned Executive Sales Duties

Federal Electric Co, Chicago, has announced the appointment of William W. Scott as general sales manager on regu-

W. W. SCOTT

lar products. Mr Scott has been associated with Federal Electric for more than 20 years. Since 1930 he served as general manager of the signal division.

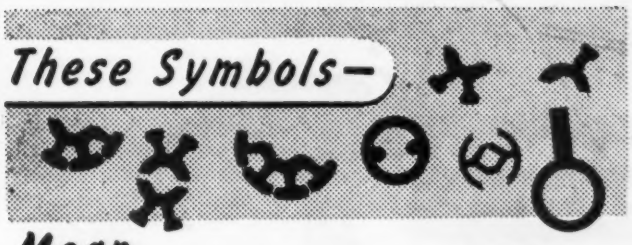
•

▶JAMES M. WHITE, vice-president in charge of manufacturing, Allis-Chalmers Manufacturing Co, Milwaukee, has resigned but will remain in an advisory capacity to President Walter Geist until July. Manufacturing operations will continue under the direction of FRED S. MACKEY, general works manager in charge of all general machinery plants, and HUGO W. LIEBERT, general works manager in charge of all tractor plants.

▶M. E. GRAYBEAL, district manager for the Kentucky Utilities Co at Somerset for the past 10 years, has been made vice-president and general manager of the recently organized Kentucky Water Service Co. The water service company purchased the water system from the Kentucky Utilities Co last December. Mr Graybeal had been connected with KU for 24 years.

▶H. COLLIN MINTON, JR, was elected president of the Star Porcelain Co and of the Frenchtown Porcelain Co at an organization meeting of the boards. Mr Minton, who has been for sometime a director and officer of these companies, succeeds ROBERT W. FERGUSON,

These Symbols—



Mean

INFINITE VARIETY IN ELECTRIC SWITCHING

They are the shapes of the standard contact elements used in ESCO multi-pole, rotary, detent switches. These elements, specially assembled to meet your particular switching requirements, permit a single control handle to operate a multi-pole, multi-stage, multi-position switch.

An infinite variety of circuit sequences can be obtained by proper assembly of the contact terminals, rotor blades, detent plates, and frame elements of which ESCO multi-pole, rotary, detent switches are composed. Whatever the control function you require . . . it can be obtained with an ESCO switch.

THESE SPECIFICATIONS
cover wide operating needs

RATINGS . . . . . 10A, 125 VAC — 5A, 250 VAC
POLES . . . . . One to 40
POSITIONS . . . . . 4, 8, or 16
HANDLES . . . . . Oval, pistol-grip, removable
MOUNTINGS . . . . . Base or panel
CONNECTIONS . . . Side

COST . . . below that of most "standard" switches.

Write today for data sheets showing the structural details that provide ESCO'S unsurpassed versatility.

PROMPT DELIVERY

For your heavy-duty applications, specify ESCO rotary snap switches . . . available in current ratings up to 200 amperes at voltages up to 460 a-c.

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PLANNED LIGHTING

Adequate lighting for any area requires the tools with which to work. ABolite offers you a complete line of reflectors to meet every illumination problem. They are finished in a special new porclain enamel that gives higher reflective quality. A few typical shapes are illustrated above. Other types, including special DUO-MOVE and easy-detachable units, are shown in our specification sheets. Plan now to meet future lighting problems with ABolite—the "Old Reliable" reflectors.

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PORCELAIN ON STEEL

New HEAVY-DUTY ELECTRIC PLANT

5000 WATTS

Only 272 lbs!

Model CK-115M
5000 WATTS
D. C.

• Large capacity, compact design, and lightweight aluminum construction are combined in this new, rugged, portable electric plant. Easily carried by two men. Powered by Onan 10 HP horizontally-opposed, two-cylinder, 4-cycle, air-cooled engine. Unusual operating economy. Shipped complete, equipped with four-receptacle outlet box and mounted in tubular-steel guard frame.

NEW ONAN CK ELECTRIC PLANTS are available in 5,000 Watts D.C., 115 and 230 volts; 2000 and 3000 Watts A.C. in all standard voltages.

ONAN ELECTRIC PLANTS—*A.C.: 350 to 35,000 Watts in all standard voltages and frequencies. D.C.: 600 to 15,000 Watts, 115 and 230 Volts. Battery Chargers: 500 to 6,000 Watts, 6, 12, 32 and 115 Volts.*

ONAN AIR-COOLED ENGINES—*CK: 2-cylinder opposed, 10 HP. BH: 2-cylinder opposed, 5.5 HP. IB: 1-cylinder, 3.25 HP.*

Onan PRODUCTS

Write for Catalog

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ONAN ELECTRIC PLANTS

retired. A native of California, Mr Minton is and will remain an active member of the law firm of Minton and Dinsmore.

▶ WHIPPLE JACOBS, president of the Belden Manufacturing Co, has been named chairman of the electrical engineering and physics division of the development program campaign of Illinois Institute of Technology. Included in the Institute's modernization, building and expansion program is an $800,000 electrical engineering and physics building, which will contain specialized laboratories for basic electrical circuits and electrical machinery, radio and television, nuclear physics, a physics demonstration museum and an integrated physics library. A trustee of Illinois Tech since 1943, Mr Jacobs is a vice-president of the National Electrical Manufacturers Association, a director of the Chicago Association of Commerce and Industry and a director of the Illinois Manufacturers Association.

▶ FRANK L. SACHA has been appointed manager of the commercial cooking division of Hotpoint, Inc, Chicago, succeeding Grant Call, who because of poor health has relinquished these duties to assume a less active roll in the organization. Mr. Sacha has been associated with Hotpoint for many years in various sales capacities. He was recently manager of the water heater sales department and before that assignment was manager of the Washington office. While in Washington he had constant executive contacts with various branches of the federal service, having been instrumental in consummating many large commercial cooking contracts for the company with the Army, Navy, Marine Corps, etc. Mr Call will continue as a consultant to the commercial cooking division.

▶ CARL E. MILLER has joined the research advisory staff of the Battelle Institute, Columbus, Ohio. Mr Miller, who was prominently identified with the Army's wartime fuel conservation program, will act as technical adviser on research in coal, gas and petroleum technology. Well known in the utilities and power field, Mr Miller was associated for eight years with the Potomac Electric Power Co, Washington, D. C., and for three years with the Northern Indiana Public Service Co, Michigan City, Ind. During the war, he served with the War Department in the Office of the Chief of Engineers as chief of the heating section and assistant chief of the utilities branch. At the present time he is serving as secretary of the executive committee of the fuels division of the

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EVERLASTING FASTENINGS

American Society of Mechanical Engineers. Mr Miller is the author of numerous articles on fuels technology which have appeared in technical and trade publications.

▶ JAMES C. PEEBLES, dean of engineering at Illinois Institute of Technology, will retire at the end of August after an association with Illinois Tech and its predecessor institutions which extends over nearly a half century. For more than 30 years Dean Peebles has been a leading research engineer in commercial and domestic insulation. He designed and built an instrument for measuring heat flow, since adopted as standard by the American Society for Testing Materials and used as standard equipment in research laboratories throughout the world. A frequent contributor to scientific journals, Dean Peebles holds membership in the American Society of Mechanical Engineers, American Society for Engineering Education and American Society for Testing Materials.

▶ WILLARD R. WEISE has been appointed assistant superintendent of electric distribution of the Cincinnati Gas & Electric Co. F. E. Pinckard has held the position of assistant superintendent since 1936, and will continue in the dual capacity with Mr Weise. Mr Weise started with the company in the underground department and has been superintendent of distribution engineering since 1946.

▶ THOMAS F. HILL, until recently assistant to the president, in charge of Duke Power Co properties in the Winston-Salem (N. C.) district, has been made supervisor of branches. CHARLES B. MILLER, JR, formerly assistant manager of the Charlotte branch, succeeds Mr Hill as manager of the Winston-Salem branch. Mr Hill has been with Duke Power since 1909.

▶ DR W. A. LAZIER has resigned as director of the Southern Research Institute, Birmingham, Ala., to join the research staff of Charles Pfizer & Co, Inc, Brooklyn.

▶ LIEUT GEN PEDRO A. DEL VALLE has been elected a vice-president of the International Telephone & Telegraph Corp and of International Standard Electric Corp, an IT&T subsidiary. General del Valle, who has just completed a distinguished military career, retired recently as director of personnel of the U. S. Marine Corps.

▶ ROBERT C. STANLEY, chairman and president of the International Nickel Co of Canada, Ltd, has been awarded the medal of the Institute of Metals (British) for 1948 in recognition of his

A Successful Project with Dolph in the picture

SYNTHITE PG-4 CLEAR BAKING VARNISH FOR HIGH TEMPERATURE RESISTANCE...

Coil Held for Submersive Activity

RESEARCH problem for the Standard Transformer Company, Warren, Ohio, was to find an insulating varnish equal to this important job:

Coils used in their high voltage transformers called for thorough impregnation to give them excellent resistance to oil and moisture and assure long service.

Dolph's Clear Baking Varnish (Synthite PG-4) proved equal to their requirements—gave them a plus in exceptionally high dielectric and good heat resistance.

Synthite PG-4 Clear Baking Varnish also affords maximum resistance to acids and alkalies and can be used on all types of electrical units, large and small. Cures in 4-8 hours at a temperature of 275° F. Write for our technical data folder on Synthite PG-4. John C. Dolph Co., 1062 Broad St., Newark, N. J.

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Dolph's INSULATING VARNISH SPECIALISTS

For a
quarter of a century—
SERVING THE UTILITIES

SUPERIOR

Test Blocks • Test Switches • Special Switches • Test Tables • Safety Blocks • Meter Enclosures • Meter Connection Units • Reactiformers • Transformer Enclosures • Accessories

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A subsidiary of the Union Metal Manufacturing Co.

outstanding services to the non-ferrous metal industries. Mr Stanley has been with the company and its predecessors since 1901. He became president in 1922 and assumed the chairmanship of the board of directors on the death of Charles Hayden in 1937.

▶ E. M. Ball, manager of dealer sales promotion, Commonwealth Edison Co, Chicago, has been elected a director of the Electric Association of Chicago to represent the utility group. In this capacity he fills the unexpired term of Will G. Kelley, who recently retired from Commonwealth Edison. Mr Ball has been in the electrical industry since 1908, engaging in the manufacturing. distribution and utility phases of the business. He joined the Edison company in 1925 and has been manager of dealer sales promotion since 1942. He is serving at present as chairman of the steering committee of the radio and electrical appliance dealer group of the Electric Association.

▶ Dale D. Spoor has been appointed sales promotion manager of Air Reduction Sales Co, New York, and Russell S. Schmidt succeeds Mr Spoor as dealer sales manager. When Air Reduction acquired the Western Oxygen Co in 1929, for which Mr Spoor had built and operated an oxygen plant at Sacramento, Calif, he transferred to the applied engineering department in New York. Mr Schmidt joined Air Reduction in 1941.

▶ Leon Bond, for eight years manager in Arkadelphia for the Arkansas Power & Light Co, has been made manager of the Camden office. Bond will succeed Allen Clift, who has been promoted to manager of the southwestern division of the company with headquarters at El Dorado. Edward G. Barry, of Hot Springs, sales manager of the western division for the past two years. has been named manager at Arkadelphia to succeed Mr Bond.

▶ John McKee has been appointed assistant to the president of Tuttle & Kift, Inc, Chicago. For many years Mr McKee was with the Norge division, Borg-Warner Corp in sales activity and as director of purchases. In recent years, he has been engaged in sales and new product development for Ferro Enamel Corp, of which Tuttle & Kift is a major subsidiary.

▶ Dr William R. Hawthorne has been appointed George Westinghouse professor of mechanical engineering at the Massachusetts Institute of Technology. He is internationally known for his research work in the gas tur-

how to plan
rate
structures
that attract
new capital

THE PROBLEM:

To provide adequate earnings in the face of

- increased operating expenses
- growing plant investments with higher new money costs
- expanding and changing loads

THE SOLUTION:

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1. Its recommendations are backed by 40 years of operating and consulting experience.
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Purchasing · Rates & Pricing · Research · Sales & Marketing
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bine, jet propulsion and combustion fields. He joined MIT in 1946 as an associate professor.

▶D. A. CAMPBELL, JR., of Allentown, division superintendent of Pennsylvania Power & Light Co's Lehigh Division operating department, has been transferred to operating headquarters, Hazleton, as assistant to the superintendent of lines and substations. He will be succeeded in Allentown by F. J. SHOVLIN, formerly division superintendent of the company's Schuylkill division. Both Mr Campbell and Mr Shovlin have had many years of varied experience in the company's operating departments. E. A. Hagenbuch, Jr, succeeds Mr Shovlin in the Schuylkill division. He had been assistant division superintendent at Harrisburg since 1943.

▶JOSEPH R. LEX has been appointed assistant general manager of the Progressive Welder Co, Detroit. Since joining Progressive in 1946, Mr Lex has been active in both sales and engineering work.

▶NELSON R. ZICHERMAN has been appointed sales manager of LaSalle Lighting Products, Inc, Buffalo, N. Y. Mr Zicherman was formerly connected with the Globe Lighting Products Co, Inc, New York.

OBITUARY

▶FRANK W. WATTS, sales manager of the Hart Manufacturing Co, Hartford, Conn., died recently at his home in Meriden after a long illness. A native of Lockport, N. Y., Mr. Watts went to Meriden five years ago from North Adams, Mass., to become sales manager of the Great American Industries, Inc. About three years ago, he was named general manager of the Meriden and Rutland (Vt.) plants of the same company and was elected a vice-president. He resigned a year ago to join the Hart Manufacturing Co. Before his association with Great American Industries, Mr. Watts had been identified with several electrical manufacturers in New York and New Jersey.

▶JAMES E. TALBOTT, electrical engineer for the Anaconda Wire & Cable Co, Hastings-on-Hudson, New York, died on Feb 21.

▶RICHARD L. JACOBS, 77, formerly manager of the Idaho Power Co. office in Payette, died in that city Feb 19, after a long illness.

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TRICO KLIPLOKS

Stop Trouble At Source.
Save Fuses . . Clips . . Power

The vise-like pressure of TRICO KLIPLOK CLAMPS locks fuse and clips together—insures the easy flow of current—prevents unnecessary shutdowns and fuse replacement, damaged equipment and lost revenue.

Tops In Quality . . . Tops In Service . . . Job Proved . . .

Production and safety engineers insist on KLIPLOKS for increased production and safety. Hundreds of thousands in use. Easily and quickly installed. No effort—no tools—no danger . . . Pay for themselves quickly in time, production and material saved.

TRICO

TRICO FUSE PULLERS

For changing fuses, adjusting clips, handling live electrical parts. Keep men on the job, not on the injury list.

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INSTALL KLIPLOKS TODAY

- Stop premature fuse blowings.
- Prevent arcing and heating at contacts.
- Reduce fire and accident hazards.

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TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

MANUFACTURERS and MARKETS

'Warmtone' Fluorescents Give 'Incandescent' Light

A fluorescent lamp which produces a light very similar to that of an incandescent lamp has been announced by Sylvania Electric Products Inc. The lamp has been designated "Warmtone." It is designed for use in homes and stores where the common fluorescents have not proved desirable. An increased efficiency of approximately 7% over corresponding wattages of standard white fluorescent lamps is claimed for the new lamps.

The lamps are expected to prove popular in store installations. Customers frequently complain that products purchased in stores where only standard fluorescents are used look different when viewed at home under incandescent light. "Warmtone" lamps also will eliminate the need of combination fluorescent-incandescent installations.

An increased use of fluorescent lighting in the home is expected. Many women who objected to use of fluorescent fixtures except in service rooms are expected to favor the "Warmtone" lamps.

The lamps are now available in 20 and 40-w sizes. The 15 and 30-w sizes will be added shortly.

•

Pennsylvania Transformer Opens N. Y. Sales Office

Pennsylvania Transformer Co, Pittsburgh, Pa, has announced the opening of a sales office in New York with headquarters at 25 Broad St, New York 4. E. S. Banghart, widely known in the transformer field in the Metropolitan area, has been named manager of the New York district. Mr Banghart has been associated with the Allis-Chalmers Manufacturing Co for 20 years in the New York and Washington offices. Previously he was New York manager of the Pittsburgh Transformer Co and earlier in his career he was identified with the United Electric Light & Power Co of New York and the New York Edison Co.

Announcement has also been made of the appointment of Rush F. Young as manager of the company's Pittsburgh sales district, with offices at the company's headquarters, 808 Ridge Av, North Side. Mr. Young became identified with the company in 1945 and for nine years prior to that he was associated with the Westinghouse Electric Corp. As manager of the Pittsburgh sales district, he will be in charge of the company's distribution and power sales in western Pennsylvania.

W. W. WAYMACK, a member of the Atomic Energy Commission, congratulates Barbara Wolff, 17, New York City, and Andrew S. Kende, 15, Evanston, Ill. The two were adjudged winners of 4-year $2,400 Westinghouse Educational Foundation scholarships. The other 38 finalists received smaller scholarships

•

Opens New Dallas Offices

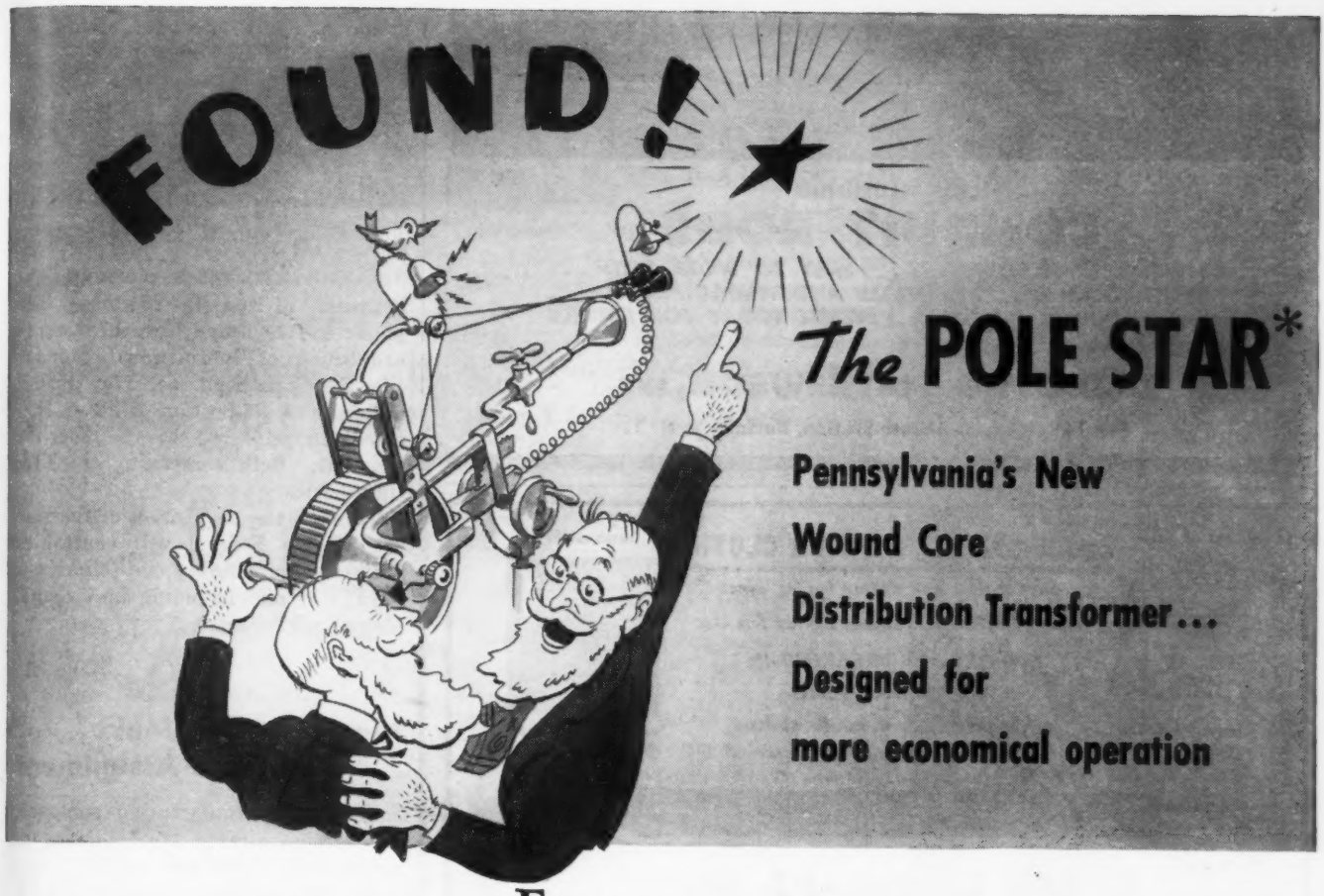
On the fifth anniversary of the founding of the Dow Corning Corp, Midland, Mich., company officials announced the opening of a new branch office in Dallas, Tex., with offices at 1617½ Elm St, Dallas 1. Max H. Leavenworth has been named head of the new office. Prior to joining Dow Corning, he was with the Army Aircraft Mechanics school at Willow Run.

Utilities and Dealers Get Together to Boost Sales

Southeastern appliance dealers are showing an increasing interest in dealer cooperative and coordination programs of electric utilities. Since the beginning of the war utilities have not pushed appliance selling. First, there was no need to build load. Second, there weren't enough appliances.

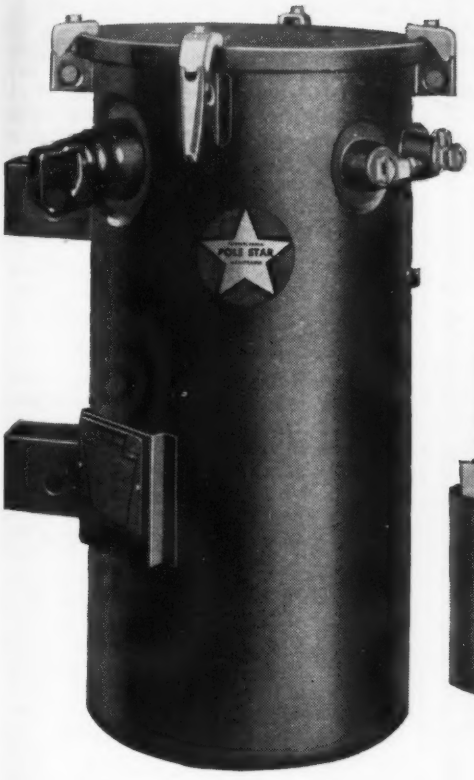
Now the utilities are rapidly increasing their capacity. And the sellers' market in appliances has become a buyers' market. Both utility and dealer realize that this is the time to get together. For the past year utilities have been getting together sales staffs and training them to sell. Intensive sales programs will follow capacity additions.

At present, most sales promotional campaigns are directed toward stimulating intense dealer activity. Adequate wiring programs are getting special



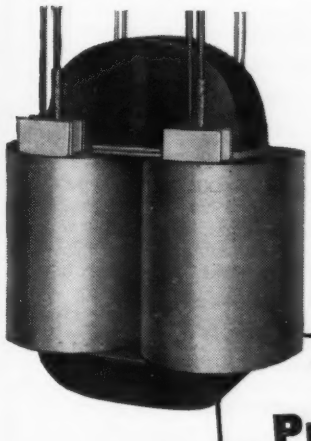
The POLE STAR*

Pennsylvania's New Wound Core Distribution Transformer... Designed for more economical operation



EMBODYING a new Wound Core Design with an inherent low exciting current, POLE STAR Transformers are made in sizes 25 Kva and below, 14400 volts and below — single phase, 60 cycles, OISC — conforming to EEI-NEMA Standards, Second Report (Revised).

One of the outstanding features of the POLE STAR Transformer is the remarkable new core developed by Pennsylvania. This small, compact core is wound of the finest grade, high permeability, cold-rolled, oriented, Silicon steel. Each lamination makes a complete turn with a single lap to form a flux path of its own. The extra steel at the lap joint keeps losses and exciting current down to a very low point.



LAMINATIONS INDIVIDUALLY LAPPED
Where the two ends of individual laminations come together they are overlapped. This 100% additional cross-section area at the lap reduces the density and prevents a concentration of flux. Because laminations are individually lapped, no gaps are present in the core. This construction assures a low exciting current.

COILS EASILY REMOVED FROM CORE
Core laminations are so arranged, they may be removed from the coils and reassembled without special tools and without changing the electrical characteristics of the steel.

***P.S.** let the POLE STAR be your guide*
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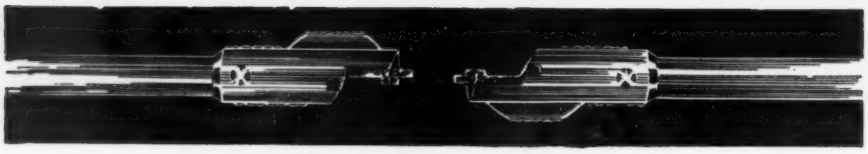
Pennsylvania **TRANSFORMER CO.**
PITTSBURGH 12, PENNSYLVANIA

PENNSYLVANIA POLE STAR TRANSFORMER



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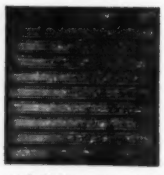

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•

Federal Telephone Expansion Approved by Directors

Consolidation of the manufacturing activities of the International Telephone & Teleghraph Corp through the acquisition of International Standard Electric Corp, New York, by Federal Telephone & Radio Corp, Clifton, N. J., has been approved by the board of directors. Both companies are IT&T subsidiaries.

Through the acquisition of the stock of ISE the Federal will control the major manufacturing subsidiaries of the ITT system, including more than 30 plants in 24 countries.

•

Manufacturers Make New Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Cochrane Corp, Philadelphia, has appointed the Henry P. Thompson Co, 416 Schmidt Bldg, Cincinnati, sales and engineering representative for its C-B high pressure condensate return system, in addition to its water conditioning equipment and steam specialties already handled in western Ohio, Indiana and eastern Kentucky. Individuals serving this territory include Herbert H. Haas, John S. Bower and Kenneth S. Matthews.

Allis-Chalmers Mfg Co has named David R. Boise manager of its Amarillo (Tex.) district office. Mr. Boise was formerly in the San Antonio office.

Burlington Instrument Co, Burlington, Iowa, has appointed the Ball Associates, Inc, 74 Niagara St, Buffalo, N. Y., representatives in the following territory: State of New York with exception of Long Island, Metropolitan area of New York City and the two southeastern counties of Rockland and Westchester, replacing the Allen-Ball Corp, 201 East Water St, Syracuse, N. Y. Announcement was also made of the appointment of the Electric Sales & Engineering Co, 2209 South First St, Milwaukee, Wis., representatives in the State of Wisconsin east of and including the counties of Lafayette, Iowa, Sauk, Junea, Wood, Clark; and south of and including the counties of Marathon, Shawano, Brown and Door replacing Fritz A. Meyer, 207 East Michigan, Milwaukee, who formerly represented the company.

•

Moves Sales Office

Cutler-Hammer, Inc, Milwaukee, has moved its San Francisco sales office and manufacturing plant to 2310 Third St.

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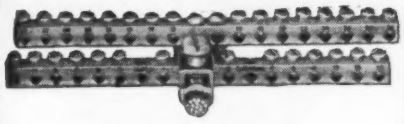

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Edison Instrument Division Adds Resistance Bulbs

The instrument division of Thomas A. Edison, Inc, West Orange, N. J., has taken over the manufacture and sale of electrical resistance bulbs formerly handled by the Edison-Splitdorf Corp, a subsidiary of the parent corporation.

In addition to a line of aircraft electrical resistance bulbs of averaging and tip-sensitive types, Edison's instrument division is also offering an expanded line of industrial bulbs in a variety of mountings for such purposes as temperature measuring, recording, alarming and controlling.

•

Gets Loan for Expansion

Because of expanding sales and corresponding increased production requirements, the A. O. Smith Corp, Milwaukee, has concluded arrangements to borrow $7,500,000 from the Prudential Insurance Co of America on a 15-year unsecured promissory note. Proceeds will be used for additional working capital.

•

Recent Rate Changes

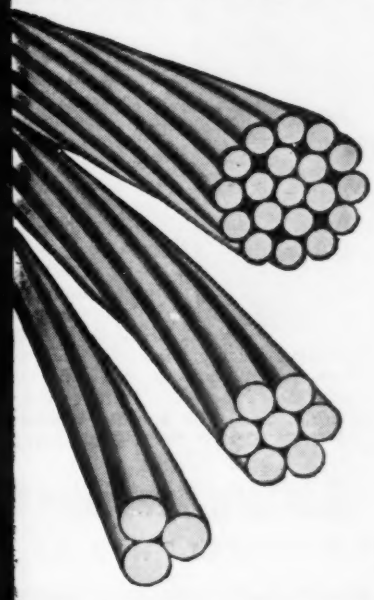
Iowa Public Service Co, Sioux City, has announced increases in electric rates in a number of Iowa cities and towns. Iowa Public Service is a subsidiary of the Sioux City Gas & Electric Co. At Carroll, the company announced an overall 2 percent increase for residential and commercial users. The announcement stated that the increase applies, effective with April billing, on more than 50 kwhr for residential and more than 75 kwhr for commercial users. District Manager W. E. Taylor at Charles City, said rates there for residential customers, using more than 50 kwhr, will increase on a range of 1 to 25 cents extra a month.

Georgia Power & Light Co's request for a rate increase (EW Feb 28, p 123) will be heard by the state Public Service Commission on March 24. The hearing was postponed from Feb 17.

Wisconsin Electric Power Co, has reduced its electric rates to effect a saving of more than $1,000,000 a year to its customers. The reductions, totaling $1,007,097, will go to the company's customers in the Milwaukee area, including South Milwaukee, Cudahy and Racine. A breakdown of the reductions shows that the savings to resident customers will be $460,159 annually; $487,138 to commercial users and $59,800 to Wisconsin Gas & Electric Co, which buys power from Wisconsin Electric Power. The new rates will be effective for service supplied after Mar 31.

Lakeland (Fla.) City Commission has approved a 10 percent increase in light and water rates for customers living outside the city limits. The rate increase was made to keep charges in line with those within the city which are now subject to a 10 percent utility tax.

PAGE
Stainless Steel
STRAND



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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Alabama—Sand Mountain Electric Co-operation, Fort Payne, 165 mi. rural distr. line and completion previously approved construction, De Kalb Co. **$760,000.**

Colorado — Bureau Reclamation, Dept. Interior, Bldg. La, Denver Federal Center, Denver, furnishing, del. f.o.b. cars shipping point or f.o.b. cars Wild's Spur, three 84 in. butterfly valves, incl. operating units, latches, and position indicators, and one set assembly and installation equipment; 3 control units for 84 in. butterfly valves, for Estes Powerplant, Colorado - Big Thompson Project, Spec. 2134. W. R. Young, ch. engr.

Georgia—Hart Co. Electric Membership Corp., Hartwell, 282 mi. rural distr. sys., imprv. and completion previously approved construction, Hart Co. **$575,000.**

Minnesota—People's Co-operative Power Assn. of Olmsted County, Rochester, 144½ mi. rural distr. lines, 52½ mi. rural transmission lines, sys. imprv. and completing previously approved construction, Olmsted Co. **$550,000.**

Neb., Schuyler — City, power plant imprvs., power piping, steel tanks, breeching, stack. $75,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., engrs.

N. Y., Brooklyn—Kings County Lighting Co., 6740 Fourth Ave., power plant exten.

N. D., Cavalier—City, H. B. Spiller, aud., furnishing, installing 300, 450 or 600 hp. diesel engine generating units, auxiliaries, etc. Est. $68,000. Plans deposit $5.

N. C., Greensboro — Greensboro News Co., P. T. Hines, genl. mgr., Greensboro, commercial television station. **$100,000-$150,000.**

Oklahoma — Oklahoma Gas & Electric Co., 301 N. Harvey St., Oklahoma City, 54 mi. 110,000 volt transmission line from Cleo Springs to Woodward, Woodward Co., **$370,000;** 55 mi. 138,000 volt transmission line from Enid to White Eagle, Garfield Co. **$400,000.**

Okla., Ponca City—Oklahoma Gas & Electric Co., 321 N. Harvey St., Oklahoma City, 20,000 kw. turbo generator for Beerbower power plant, near here. **$3,619,000.** Frank Partridge, 319 N. Harvey St., Oklahoma City, engr.

Pa., Norristown—Dpt. Property & Supplies, 18 and Herr Sts., Harrisburg, boiler plant and steam tunnel at Norristown State Hospital. $1,500,000. Plans deposit $10. Stewart A. Jellett Co., 1200 Locust St., Phila., engr.

Tennessee—U. S. Eng., P. O. Box 1070, Nashville, furnishing, del. f.o.b. cars Lancaster, Schedule 1, seven main power transformers and 2 neutral grounding reactors; Schedule II, four main power transformers, Central Hill Power Plant, Caney Fork River, (Cumberland River Basin), Serial No. W-40-058-eng-48-59.

Texas—Guadalupe Valley Electric Co-operative, Cost, 546 mi. rural distr. lines and 23 mi. electric transmission line and sys. imprvs., Gonzales Co. **$1,430,000.**

Texas—Quadalupe Valley Electric Corp., Seguin, rural distr. lines, Guadalupe, Caldwell, Gonzales, La Vaca and Wilson Counties. **$800,000.**

Tex., Waco—Texas Power & Light Co., c/o John C. Young, Waco electric booster or sub-station plant. **$750,000.**

Wisconsin, Illinois and Minnesota—Dairyland Power Co-operative, 407 Rivoli Bldg., sub-station each in Joe Daviess Co. and Carroll Co., Ill., switching station each in Chippewa Co. and Lafayette Co., Wisc., and Houston, Minn. Plans deposit $25. Laramore & Douglass, Inc., 327 S. LaSalle St., Chicago, Ill., engrs.

Wisc., Manitowoc — Manitowoc Public Utilities, 817 Franklin St., 2 and 3 story, 80 x 108 ft. turbine room, 1 story, 24 x 50 ft. intake well extens., steel, brick, concrete fdn. Plans deposit $10.

Wyoming — Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., power transmission lines unit, furnishing transformers, power

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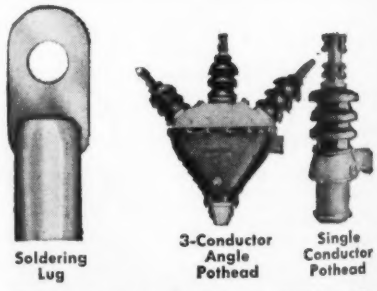

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circuit breakers, and switches, protective and metering equip. for Lusk sub-station, (North Platte River Dist.), Missouri Basin Proj., Spec. NP-1277.

Wyoming — Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., 3 generator protective equip. cubicles, 9 current and three 25 kva. transformers and three 66.4 volt resistor units, for Kortes Power Plant, Missouri Basin Proj., Spec. 2132.

Low Bidders & Contracts Awarded

California—Pacific Gas & Electric Co., 245 Market St., San Francisco, diversion dam and intake structure for Cresta Power Plant on North Fork of Feather River and diversion dam, intake structure and tunnel for Rock Creek Power Plant, Butte Co., to Morrison-Knudsen Co., Inc., Crocker 1st National Bank Bldg. Est. about **$8,000,000.**

Fla., Miami—Fort Industry Co., c/o Robert L. Weed, archt., du Pont Bldg., radio station, to General Builders Corp., Aviation Bldg. Over **$100,000.**

Montana — Bureau Reclamation, Dpt. Interior, Fort Peck, Feb. 26, 1,500 kva., 115,000 to 34,500 volt sub-station, lump sum for McCone Co. Electric Co-operative Sub-station, Fort Peck Proj., near Glendive, Spec. 2070, from C-L Electric Co., 410 S. Main St., Pocatello, Idaho. **$114,669.**

Nebraska — Rural Electric Co., Pine Bluffs, Wyo., labor for 352.5 mi. rural distr. lines Cheyenne, Morrill and Kimball Counties, to Foree Constr. Co., Natl. Bank of Topeka Bldg., Topeka, Kan. **$98,800.** Bids 2/17.

Washington—Bureau Reclamation, Dpt. Interior, Coulee Dam, Feb. 25, completing control bay, control cable tunnel, parking area, and misc. finish for right power plant, constructing transformer circuits, tie circuits and right switchyard at Grand Coulee Dam. Spec. 2075, from Morris-Knudsen Co. Inc., Hoge Bldg., Seattle, and Peter Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, Neb. **$2,780,284.**

Washington—Bureau Reclamation, Dpt. Interior, Building 1-A, Denver Federal Center, Denver, Colo., Feb. 19, Schedule 1, one 6,900 volt switchgear unit and Schedule 2, two motor control and one heating-contractor board, from Westinghouse Electric Corp., Gas and Electric Bldg., Denver, Colo., **$100,170** and **$31,610** respectively***Schedule 2, two heating and light unit sub-stations and 10 power unit sub-stations from I-T-E Circuit Breaker Co., 19 and Hamilton Sts., Phila., Pa., **$181,677**, all above for Columbia Basin Proj., Grand Coulee Power Plant, Spec. 2051.

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Proposed Construction

Ind., Kokomo—Continental Steel Corp., S. Main St., plant extens., equip. Over **$1,500,000.**

Kan., Ulysses—Magnolia Petroleum Co., Wichita, natural gasoline extraction plant, 100,000,000 cu. ft. daily capacity, 19,000 gal. gasoline, 15,000 gal. liquefied petroleum gases daily. **$7,500,000.**

Pa., Pittsburgh—Peoples Natural Gas Co., 545 Wm. Penn Way, plant addns., during 1948 and 1949. **$13,000,000.**

Tex., Houston — Dow J. Zabolio & Assoc., self-contained model city housing. **$19,000,000.**

Wash., Seattle—Suburban Co., c/o B. B. Ehrlichman, Exchange Bldg., Zone 4, plans by John Graham, Jr., Dexter Horton Bldg., Zone 4, shopping center, 5 Ave. N.E. and E 105 St. **$9,000,000.**

Low Bidders & Contracts Awarded

Ore., Portland—Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash. 25, D. C., March 2, 150-bed addn. to Tuberculosis Hospital, from Del E. Webb, 5101 San Fernando Rd., Los Angeles 26, Calif., **$2,593,952**; elevators, from Otis Elevator Co., 810 18 St. N.W., Wash. 25, D. C., **$143,746.**

Pa., Altoona—U. S. Eng., 925 New Federal Bldg., Pittsburgh, Zone 19, 200-bed hospital for Veterans Admin., Vermont Ave. between H and I Sts. N.W., Wash. 25, D. C., to Mellon-Stuart Co., 210 E. Park Way, Pittsburgh. **$5,021,150.** Bids 2/18.

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